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FERRIS & MILES' PATENT STEAM HAMMER.

"Have you seen Manchester?" exclaims an illustrious modern writer. Manchester is a greater human exploit than Rome or Athens." He is addressing one of those ardent youths who find nothing to admire in the present; whose eyes are in the back of their heads gazing retrospectively at Antiquity, blind to the overwhelming display of human energy their own century affords as well in its artistic and military as in its mechanical and scientific development.

Manchester is thus mentioned as the exponent of no less a fact that the subjugation by the human mind of the material world, the fibres of whose surface are woven by the spindles of Arkwright, and whose mineral depths are forged and fashioned by the mechanism of Whitworth and of Nasmyth.

American genius has not been backward in its contributions to this peaceful victory of the spiritual over the material forces of nature. We can point to as many inventions as our English cousins—as many forges, factories, mines; more railroads and a greater general application of machinery. All over our country steel works are being established. Every day we see among us some new thing done by machinery, something old ceasing to be done by hand. Chipping and filing have grown nearly obsolete in the machine shop, and before the inroads of the *Steam Hammer* the hand sledges threaten to disappear from the forge.

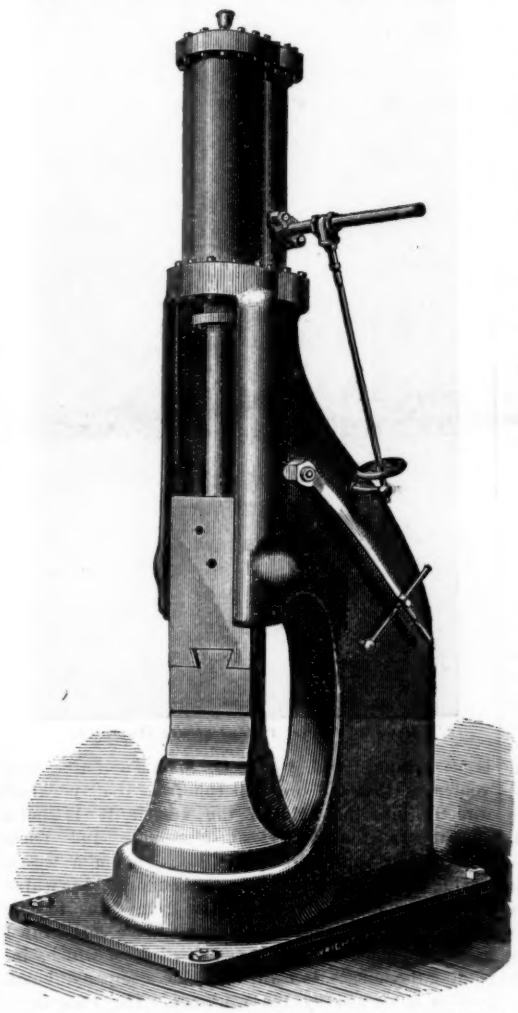
It is true we have not as yet any of these powerful machines in our country which can approach in size or strength to the enormous steam hammers used in England and on the continent of Europe where Krupp at the famous steel works in Essen employs them of 50 and 130 tons weight of ram. We believe there are none in operation here of more than fifteen tons, but we have reason to think that the smaller sizes have been brought to a higher state of development and are of more elegant design than any foreign ones.

Now when self-acting steam hammers are multiplying around us, when every forge and rolling mill, every steel works, every railroad repair and car shop, and every private manufactory are provided with these wonderful economizers of work, when trip hammers and drop hammers and belt hammers are being thrown aside and their places filled with self-acting steam hammers, and even most ordinary smith shops which can afford a steam boiler are putting in these important auxiliaries, doubtless some illustration of them will not be unacceptable to our readers.

Unlike the steam engine, which has fixed centres and a constant stroke of piston, the steam hammer as constructed to meet the requirements of modern steam forging must be capable of an infinite variety of stroke, ranging from that of the entire length of the cylinder down to two or three inches, and this by insensible gradations and without any fixed points; so that the operator may by the simple movement of one hand cause it to make its shortest stroke at any point in the whole piston travel, whether at the top or at the bottom, or any intermediate point; increase its speed, or its length, or its force, either gradually or suddenly; totally suspend its action, strike a single blow of any required force, or a shower of blows all alike or all differing from each other—and this with an ease and nicety of graduation wholly inconceivable to those who have not witnessed the actual operation.

It is really astonishing to find by what a simple mechanism all this amazing variety is produced. At the first glance it would seem to require the most complicated paraphernalia of valves, levers, tappets, sliding-blocks, etc.; and in fact the earlier self-acting hammers were encumbered with so many of these objectionable features, known as "traps" among practical mechanics, that they were continually breaking down and giving trouble. This created a prejudice against them in the minds of most engineers and for a long time prevented their general introduction. The advantages they offered were, however, so many and so attractive, especially for steel making, that many ingenious inventors have set themselves to make them at once simple and durable, and one after another have reduced the number ot working parts, applied new devices less cumbrous and more direct, until, as it stands at the present day, a first-class self-acting steam hammer by the best makers is a machine of remarkable simplicity.

This will be apparent upon inspection of the illustrations in our present number, which represent one combining the most recent improvements in these machines. It is of the simple frame pattern with separate anvil and is manufactured by Messrs Ferris & Miles of Philadelphia. These gentlemen are the latest in the field and claim that they have pushed forward another step or two on the difficult road to perfection.



FERRIS & MILES' PATENT STEAM HAMMER.

The illustrations consist of a perspective view and a diagram of the valve motion. It will be observed at the outset that a peculiarly simple and direct, or purpose-like appearance is imparted to the hammer by its ram being set diagonally to the frame and guided by the corners instead of being parallel and guided by tongues planed upon the ram or in the frame. The makers have patented this arrangement, which, they believe, offers certain practical advantages otherwise unattainable. Some of those are:—greater available surface of dies or bits and that surface furthermore disposed in the most convenient direction for the workmen at the anvil, as well as in applying formers, swages, etc.; simpler form and greater cheapness of the dies and their patterns as compared with the old skew dies; increased thickness of anvil, which is equal to the length of the die instead of its thickness; and principally that, owing to these and the powerful action of their improved valve gear, a heavier class of work can be done under a hammer of the same nominal size and price than was previously possible.

The cylinder is a separate casting bolted to the frame with through bolts instead of studs. Its exhaust is taken off at a point below the floor of the cylinder, so that the condensed steam finds its way out through the exhaust pipe continually and is thus prevented from embarrassing the action.

There is an arrangement by which the piston packing rings can be renewed without taking the rod out of the ram, thus avoiding much delay and inconvenience. Also an improved hand clamp for holding the hand lever *G*,* on its bar at any desired point without notches on springs. The frame is brought up around the anvil above the floor line to a greater or less height, according to the size of the machine, so as to assist in supporting it correctly in its place and in the smaller sizes the frame is bored and the anvil turned to fit it.

The diagram shows the valve *C*, supported by a rod *D*, upon one arm, *I*, of a rocker, whose other arm is pressed by their weight against an incline, *f f*, planed on the back or side of the ram, which is represented by the full lines as in its lowest position resting on the anvil, and by the dotted ones as at the top of the stroke. *B*, is the piston rod. The rocker is pivoted to the short arm of a hand lever, *H*, which has a fixed fulcrum at *H*, and some convenient means for clamping its longer extremity at any desired point on the curve or bar, *J J*.

This comprises the whole of the valve gear, and in the smaller sizes the rod *D* is omitted and the valve stem attached directly to the rocker.

Now by moving the longer extremity of the hand-lever upon the arc *J, J*, the shorter arm will describe the proportionally smaller arc *I, G*, carrying with it the rocker, *I*, and of course the valve which is supported upon it, thus giving steam either above or below the piston at will and consequently governing the motion of the ram by a movement of the hand.

M, M, is the steam side of the valve and *K, K*, the exhaust, the valve is hollow, and the steam from the top of the piston is exhausted through the passage *C*. It must be borne in mind that the valve is perfectly balanced and the stem comes through from the exhaust side, thus avoiding both friction in the stuffing-box, which is only packed to resist atmospheric pressure, and also the usual unbalanced area of valve stem when the connection is on the steam side.

The rocker being pivoted on the short arm of the hand lever is free to vibrate on its centre, *I*, into the position shown by the broken lines, so that when the longer extremity is held still at any point on *J, J*, the action of the incline plane on the ram will cause the rocker thus to vibrate, provided steam enough is admitted through the throttle valve to raise the piston. This will reverse the valve automatically and produce a reciprocating, self-acting motion whose extent will vary in proportion to the amount of steam admitted and whose position as part or whole of the stroke will be controlled by the position of the centre, *I*, on the arc *I, G*, which of course is governed by that of the long end of the lever on *J, J*.

The working parts of the valve gear are thus reduced to a rocker and valve with a rod to connect them, and yet with this simple device, by properly adjusting the admission of the steam and varying the position of the hand lever, the most minute and sensitive gradations or the most sudden changes may be made instantly by the slightest motion of the hand and without effort.

Some of the resulting advantages claimed for this arrangement are the following, viz:

That by working the valve from the exhaust side and otherwise balancing it perfectly a great reduction is effected in the power required to work it, which results

* See diagram on next page.

in a wonderful facility of handling, diminution of friction, wear and tear, etc. That there are very few pieces to wear, and absolutely nothing to get out of order, and that as the valve rests on the rocker and this last against the ram by gravity, it takes up by the same means its wear and its own lost motion.

Also, there being no attachment of the rocker to the ram, the latter is free to descend upon the iron alone, driven by the top steam, while the rocker and valve falling by the action of gravity only are comparatively retarded. This has the double effect of enabling the top steam to follow the piston so as to strike a violent blow, while at the same time the valve gear not having overtaken the ram in its descent escapes all concussion. We have seen these hammers in operation at the makers' works and were much pleased with their simplicity and efficient action. They are built in sizes from 100 pounds upwards with single or double frames, according to the size of the machine.

The makers' address is N. E. Corner Twenty-fourth and Wood Streets, Philadelphia, Pa.

Contributions.

THE MILWAUKEE IRON COMPANY.

The public at large have a general interest in the growth and success of all our manufacturing interests. Many works grow up silently, and but little is known of them except through the press; but a knowledge of them even in this way has a stimulating effect. The works about which we now write do not need a "puff," as they are in successful operation and have more orders than they can fill, for several months to come. We shall therefore not enter into a detailed description of the works, but only present those salient and characteristic features which will appear to one making a short visit, or who is slightly acquainted with them. The company was chartered in January 1866. The plans were prepared soon after by Wm. F. Durfee, the Engineer, and O. W. Potter, Superintendent of the Chicago Rolling Mills. The site was selected at Bay View, just south of the city of Milwaukee, and 114 acres purchased, and the work of erecting the rolling mill commenced in June, of the same year, 1866. The building was completed, and the first bar was rolled March 8, 1868, since which time the mill has been in successful operation.

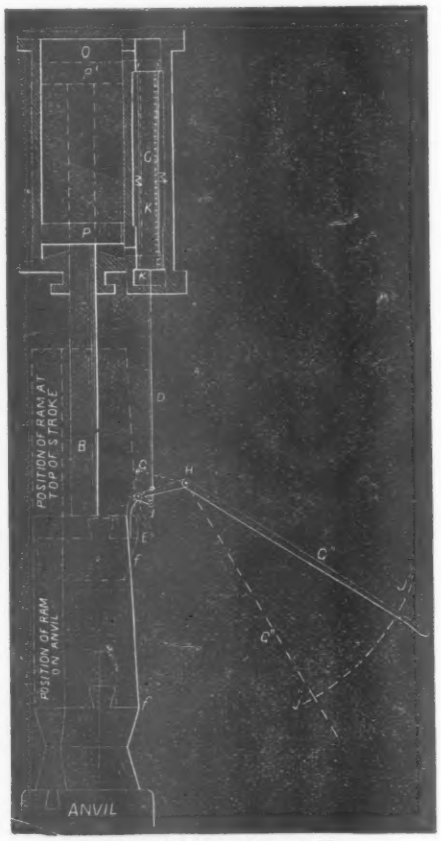
The building is 180 feet wide and 210 feet long. The primary object was to re-roll old rails, and for this purpose it has all the appliances necessary and of the most approved style. In it are ten steam engines, the largest of which is a Corliss engine 42×44 inches, for driving the heavy roll train, five steam pumps, two roll trains, five heating furnaces, and the usual accompaniments of shears, punches, scales, rail straighteners, and a squeezer for the puddle mill. The mill can turn out 30,000 tons of rails per year.

According to the original design, the business would be dependent upon the supply of old rails; but with a view to be independent, and to enlarge their works, this company, jointly with the Chicago and Wyandotte companies, all of which are controlled by E. B. Ward, of Detroit, purchased the property of the Swedes Iron Company, the principal part of which was the iron mine at Iron Ridge, about 43 miles northwestward from Milwaukee. The object of the purchase was to enable them to make their own iron, at least in part, and also to sell to other parties. Mr. John Plyer of England was secured to design and build two blast furnaces whose capacity should be 40 tons of pig iron per day. One of these furnaces is completed and has been in successful operation for several months, and proves to exceed the capacity for which it was designed. It will turn out over 330 tons per week. It is the largest furnace in the country, excepting those of equal size at the Chicago Works. The waste gases are taken from the furnace and are burned to produce the hot blast and generate steam for operating the blast engine, steam pump and hoisting engine. All the heat appears to be utilized. It is a grand success in every respect. As we have looked at it at any time—night or day—and seen only a small amount of white smoke passing lazily from the stack, we could hardly realize that in the furnace where it was generated there was a furious heat of hundreds, yes thousands of degrees, sufficient to quickly smelt iron and limestone—so furious that it reduces daily hundreds of tons of materials—coal, coke, ore and stone. The sight, in the nighttime, contrasted strangely with the glowing, flashing flame which issued from the stacks of the puddling furnaces near by. The waste of fuel in our puddling furnaces is alarming. If a puddling furnace is made which will come into general use that will economize heat as thoroughly as Pryer's blast furnace does, future generations will rise up and bless the inventor.

The second blast furnace will be completed and ready for use in two or three months. This part of the works, when completed, will consist of the two blast furnaces just mentioned, two cast houses, two large blast engines, six steam boilers, four steam pumps, two steam hoists, scale house, stock sheds, etc.

Near by are two puddle mills, one of which has sixteen puddling furnaces, and has been in successful operation for some months; and the other 240 feet long and 80 feet wide, containing sixteen furnaces and a wing for a steam engine, and a train of rolls and squeezer will soon be completed. When all these are in operation they hope to be able to make *new rails* from their own iron, or at least to be but slightly dependent upon old rails or old iron to keep them running. In the immediate vicinity is a machine shop, a carpenter's shop, pattern shop, and a blacksmith shop.

The company has recently erected an ore dock, which is about 38 feet above the water in the bay, to facilitate shipping the Iron Ridge ore to Chicago, Wyandotte and other points. It will hold some 3,000 tons of ore, and



Miles & Ferris' Patent Steam Hammer.

is so arranged with "pockets," spouts and other conveniences that the ore will run from the "pockets" directly into the hold of the vessel. It is quite similar to the docks at Marquette and Escanaba. The approach to the dock is on a trestle having a grade of four feet to the hundred, up which an ordinary locomotive will push from three to five loaded cars with ease. A thriving village has grown up in the immediate vicinity, a portion of which, including the houses, is owned by the company, but a portion is owned by the workmen. The company's land is sold with one restriction—"there shall be no intoxicating liquor made or sold on the premises." There is not a saloon at Bay View.

The works when completed will cost, we are informed, over one million of dollars. One might suppose that such a growth in so short a time, would so satisfy any one that he would be willing to let them solidify and produce. But not so with the company. It believes in *using* its money and in accordance with this spirit, the company is now prepared to erect steel works on the pneumatic or Bessemer process. Similar works will be erected at Chicago.

Milwaukee possesses some natural advantages over other places in the manufacture of iron. The Lake Superior ore of which they use large quantities for mixing with Iron Ridge ore, can be delivered there cheaper than at any other manufacturing point on the lower lakes or further south, and the Iron Ridge ore costs less than $2 per ton at the works. The freight on coal from Buffalo and Cleveland is small, and it is often taken at a mere nominal price, as it is sometimes sought for ballast. Its advantages for shipping for all points is so evident that it is useless to more than mention them.

The future of this company is promising. It has a fairer prospect of covering 40 acres with its works than Friedrich Krupp had when he commenced, if they only have the determination to do it.

MR. W. W. EVANS ON THE FAIRLIE ENGINE.

We give below the paper on the Fairlie engine prepared by Mr. Walton W. Evans, a well known engineer of New York, who has had much experience on mountain railroads in South America, and read before the Master Mechanics' Association at their late meeting in Philadelphia by their Secretary, Mr. L. P. Dodge:

NEW YORK, September 10, 1870.

To the Master Mechanics' Association:

GENTLEMEN:—I beg leave to bring to your attention some facts and figures in reference to the so called "Fairlie" engine, which the activity and energy of Mr. Robert Fairlie have brought into very prominent notice in the railway world, particularly in Europe, where Mr. Fairlie has left nothing undone to get this particular design adopted, after having christened it with his own name, which he flourished in every possible way before the public as the inventor, hoping to get his works patronized, and believing he was about to revolutionize the whole railway system. Mr. Colburn told me, only a few days before his death, that Mr. Fairlie had "tipped" everyone that had anything to do with this engine. I suppose there was some truth in this statement, as the different accounts of the weight of his engine "Progress," certified to by railway men in England, appear to prove that some one had been "tipped" to tell a story that varies somewhat from the truth; for in Fairlie's pamphlet, called "Opinions of the Press," this engine is put down on page 1 as weighing 40 tons, on page 2 it is called 38 tons empty, and 44 tons in running order. In Fairlie's other pamphlet, detailing trials of this engine in February last before the Duke of Sutherland and a crowd of counts and barons and other such great judges of locomotive engines, this very engine, the "Progress," is put down as 54 tons. Mr. Colburn told me he had weig ed, examined, and reported on this engine to the Erie Railway, and that it weighed over 60 tons. On asking him if these figures were positive, he replied, "Yes; I am sure it was over 60 tons English, and 67 tons American." (I am sorry this report cannot be found among the papers of the Erie Railway.)

I am satisfied Mr. Fairlie is conscientious in believing that he has picked up a good thing in railway mechanism, but I can hardly imagine he has been able to worry himself into the belief that he is the inventor of this "little wonder" of the day, for the history of it is a plainly written and printed record. It was first invented more than eighteen years since, in every one of its chief features, by the "Cockerells," of Seraing, in Belgium, to work the steep inclines of the "Semmering," in the Noric Alps of Austria. It was entered for the prize offered by the Austrian Government and came in third best, the "Bavaria" taking the 2 ,000 ducat prize. All these engines were failures, as none of them were adopted to run that line. A record of all these engines was sent to me at the time by an Austrian engineer.

The Seraing engine (now called the Fairlie engine) was illustrated and described in Herr Engerth's German work on locomotive engines, published, I think, over sixteen years since. An illustration and detailed description of this Seraing engine can be found on page 84, volume 1, of *Engineering*. Mr. Colburn knew very well the origin of this engine, but he allowed himself to stand stultified on the pages of his own journal by writing articles in favor of the Fairlie engine, and by these articles leading the public to believe that Mr. Fairlie was the inventor, when he knew to the contrary.

Some years after the failure of the Seraing engine, Jean Jacquier, of Mulhausen, in France, reinvented this engine, or one very much like it. (I have not the record at hand to refer to.) This was also a failure. Some years after this, Petit, of the Great Northern of France, again reinvented this engine, or one somewhat similar, and again it was a failure. Fairlie then takes up the idea, calls it his own, and preaches its merits so strongly to Sir Charles Fox that he ordered three for the Queensland Railway. They were built by Cross of St. Hellen's, and sent out. One only was erected, and you can judge of its wonderful power and efficiency by a passage from the report of Mr. Jetter, Locomotive Superintendent of that railway, which says: "The one engine that was placed under steam refused to "run around five-chain curves, and after distorting the "gauge, with infinite local damage to the road, and some "damage to itself, it became helpless and had to be tow-"ed back to the shed." (See *Engineering* vol. 8, page 262.)

Mr. Fairlie has been very active in trying to introduce some of his engines on the railways that I am interested in in South America, and I am pleased to find

that he has succeeded in obtaining an order for one for the "Iqueque" Railway, of Peru, where I have two of the Rogers engines, and where we can test their relative merits on the same track and under the same conditions. There need be no fear as to the results. This engine, the "Tarapaca," I see by *Engineering* of August 19, is finished and tested. It is said to weigh 60 tons. Mr. Fairlie in calculating what it can do puts down "car friction" at 10 pounds per ton. What would be thought of an engineer in this country that would, in engine trials, allow ten pounds per ton for car frictions?

Mr. Fairlie, in writing to my friends, in a letter now before me, says his engines run so beautifully, steady, and easy on the road that "rails will last *just* three times as long as with the ordinary tank engines." What an attempt at humbug! I wonder where Mr. Fairlie procures his data for the assertion of "*just three times as long*" He then goes on to ask, in case any orders are sent to him for engines to work these very severe gradients in Peru, that the section or profile should be arranged with breathing places in them. I should like to know the name of an American locomotive engineer that ever asked for a road to be located with "breathing places" for his engines. Can you name me one? I might mention here, that the Arequipa Railway, alluded to, is one of the most severe lines ever built. It has long gradients of 211 feet per mile—1 in 25—and very many curves of 350 feet radius. It overcomes an elevation of 7,552 feet in reaching the city of Arequipa, from which point we are now engaged in extending the line to Lake Titicaca, an inland sea. This line crosses the main ridge of the Cordilleras at an elevation of nearly 15,000 feet. About 70 miles of the line is at this elevation, which is near the line of perpetual snow. The barometer at this height falls to about 14 inches, so we have in a cubic foot of the atmosphere less than half of the oxygen we find in the same at the level of the sea. This leaves a problem to be solved, in reference to the combustion of fuel in locomotives. If Mr. Fairlie's engines require breathing places on the way up, I am afraid they will be entirely out of breath before reaching the top.

The engines now working this road were, by contract with the Peruvian Government, guaranteed to carry 50 tons of net cargo, up 4 per cent. gradients and around curves of 350 feet radius. It was thought by some English engineers that engines could not be procured to do this that would not be regular crushers of rails. The engines sent out are daily taking up these gradients 100 tons net cargo, to the surprise of all concerned. I have received letters from English engineers and English gentlemen who speak in great admiration of them, and say they are all good, all "A. No. 1." One English engineer, who was present by order of the Government, at the Government trial of the "Conquistador," (the trial I have tabulated in engine comparisons), wrote me as follows: "These engines perform astonishingly. "They round the sharp curves with the smoothness of "a velocipede. The combustion of fuel was perfect, "although the coal was very dirty."

Wishing to know the comparative powers and duty performed by the Fairlie engines, at their much vaunted trials in England, and some of the American engines I had built for service in South America, I took the data for Fairlie engines from his pamphlet, vouched for by himself, and then the data for the American engines as it was taken by English engineers, as well as by American, at the trials.

I have, as far as it can be done, brought all the engine performances to one standard, namely, foot-pounds of work done, in hauling train alone, exclusive of engine, per hour, per ton of weight on driving-wheels. These figures will be found at the bottom of the table of comparisons, a copy of which I send you and can vouch for its accuracy. I have given in the table all the figures, from which these results are obtained. The great difference shown in duty performed, between the two American engines, is attributable chiefly to the fact that the "San Bernardo" was tried on a line, where the curves were very easy, the gradients not severe, the fuel very good, and the engine worked up nearly to her limit of power; while the "Conquistador" was running on a line with many sharp curves, extremely severe gradients, very poor fuel, and was not, intentionally worked up to the power she possessed. The advocates of the Fairlie engine will have no occasion to rejoice should this table ever reach their eyes; but if it should, they will cast it aside as unreliable, the same way as the English paper, *The Engineer*, did the result of the trials between American and English engines ordered by the Chili Government in 1859, and carried out under my direction, I having with me, at my request, throughout the four days of trials, Mr. Bayles, the English Locomotive Superintendent of the Valparaiso Railway, the cleverest mechanical engineer that ever went from England to the West Coast. The London *Engineer* pronounced these reports of trials lies, and English engineers still believe them such, for the day has not yet arrived when they can be introduced in England to a locomotive that can show a record of over 41 millions of foot-pounds of work done in hauling trains alone, per hour, per ton of weight on drivers.

I am, gentlemen,
Your Obedient Servant,
W. W. EVANS.

COMPARISON OF FAIRLIE AND ROGERS ENGINES.

No.		FAIRLIE ENGINES.		AMERICAN ENGINES.	
		Little Wonder.	Progress.	San Bernardo.	Conquistador
1	Name of Road...	Festiniog.	Mid Wales.	Southern of Chili.	Arequipa, of Peru.
2	Gauge.....	1 ft .11¼ in.	4 ft. 8½ in.	5 ft. 6 in.	4 ft. 8½ in.
3	Weight of engine, loaded, gross tons	19.50	54	28.11	34.21
4	Weight of engines on drivers, loaded, gross tons..	19.50	54	17.48	25.89
5	Weight of engine, per single driving wheel, gross tons.....	2.44	6.75	4.37	4.31
6	Number of driving wheels.....	8	8	4	6
7	Number of wheels under engine...	8	8	8	10
8	Length of wheel base, feet.....	19	22	22	23ft. 7½ in.
9	Diameter of driving wheels, inches.....	28	54	56½	49
1	Number of cylinders....	4	4	2	2
11	Dimensions of cylinders, inches	8 3-16x13	15x22	16x24	18x24
12	Average pressure of steam, during trial, in lbs.....	175	140	115	130
13	Adhesion at 20 per cent. of weight on drivers, in lbs.....	8,736	24,192	7,831	11,599
1	Adhesion at 3 per cent. of weight on drivers, in lbs.....	13,104	36,288	11,746	17 898
15	Load hauled, excluding engine, in gross tons...	121.875	476	340.89	188.88
16	Load hauled, including engine, gross tons.....	141.375	530	369	173.09
17	Gradient ratio of height to base..	1 in 92	1 in 90	1 in 94.3	1 in 25
18	Gradient in feet, per mile.....	57.30	58.70	56	211.20
19	A speed of train, miles per hour.	11.25	8	17	10
20	Resistance of gravity, lbs.....	3,442	13,191	8,765	15,568
21	Resistance of rolling friction, at 5 lbs per ton....	707	2,650	1,845	865
22	Resistance of oscillations and concussions $\frac{v^2}{10}$.	159	424	627	173
23	Resistance of air, at 100 sq. ft., front area.....	31	16	72	25
24	Resistance of friction in engine, at 10 lbs per ton.....	195	540	281	342
25	Total resistances.	4,534	16,821	11,590	16 913
26	Percentage of tractive adhesion of engine utilized.....	10½ per cent	14 per cent.	29½ per cent	29 per cent.
27	Pounds traction, per ton, of engine alone.....	233	311	412	494
28	Proportional power per ton, the "Little Wonder" taken as unity.....	1	1.34	1.77	2.12
29	Foot pounds of work done, per hour, calculated from resistances	269,319,600	710,519,040	1,040,318,400	893.006 400
30	Foot pounds of work done per hour, per ton of weight on drivers, calculated from resistances	13,811,261	13,157,760	59,514,782	34 492,329
31	Total foot pounds of work done per hour.....	204,189,644	557,509,120	786,885,120	818,867,840
32	Foot pounds of work done per hour per ton of weight on drivers (from weight of train and elevation overcome.....	10,468,699	10,324,342	45,016,311	31,624,868
33	Foot pounds of work done, in lifting train alone, per hour.	175,982,419	500,706,304	726,941,107	657,094,614
34	Foot pounds of work done, in lifting train alone, per hour, per ton of weight on drivers.....	9,024,739	9,272,339	41,587,020	25,377,544

MEMORANDA IN REFERENCE TO THE ABOVE ENGINE COMPARISONS.

1. In calculating atmospheric resistance, I have used the frontage formula, not having the cubic feet of bulk in the train, the only proper data from which to calculate the atmospheric resistance. The total amounts, in the cases stated, are not important, as the speed was not great.

2. The American engines were running on tracks built by Americans, and in the American cheap style, while the Fairlie engines were running on English railway tracks, which are, in England at least, considered to be the best in the world.

3. The "San Bernardo" was running on a track which was essentially straight, the minimum curvature being 6,562 feet radius. The "Conquistador" was run on a track full of curves of 350 feet radius, combined with gradients of 3 per cent. (158 ft. per mile) and encountering long gradients of 4 per cent. (211 feet per mile) combined with curves of greater radius. The data for comparison was taken while running on the 4 per cent. gradients. This in a measure accounts for the wide difference between the performances of the two American engines; for D. K. Clark, in his work on locomotives, says on page 267, "It was estimated that a curvey line, having one curve "under one mile radius for every 2½ miles, incurred an "excess of resistance equal to 20 per cent of that due to "a line practically straight."

4. In the table, the Fairlie engine "Progress" is taken at 54 tons. Colburn weighed the engine and found it to weigh over 60 tons.

5. The only fair and perfectly reliable way to test engine performances is to get them on the same track, under the same conditions; but in the above table of comparisons the differences are so enormous that it is easy to tell where the greatest merit lies.

6. Engine frictions vary greatly; but for the above calculations 10 pounds per ton is taken as a fair average for all. Fairlie calls the friction of his engine 18 pounds per ton.

7. There is no allowance made in the table for adhesion, being less on the steep gradients than on ordinary gradients.

8. The American engines, in both trials, showed their ability to make all the steam required on the maximum gradients, in fact the fire-door of the "San Bernardo" had to be kept open, most of the time, to keep her steam down to 115 pounds, the limit agreed upon. The Fairlie engines failed to make the steam required.

9. The Fairlie engine "Progress" could not start her train of 472 tons on a gradient of 1 in 90 with 150 pounds of steam. The "San Bernardo," with less than ⅓ the weight on drivers, started a train of 559 gross tons, one brake screwed down, on a grade of 1 in 400, with 118 pounds of steam.

10. Fairlie's data for calculation are not complete. The most favorable in his pamphlet for the "Progress" is that she was running with 476 tons, at eight miles per hour, with 140 pounds of steam, up a gradient of 1 in 90.

IMPROVED STREET RAILROAD CARS.

But few people are aware, we suppose, of the extent of the traffic of our street railroad companies, or of the amount of capital and active enterprise required for its management. Considering how recently the system had its commencement, we must regard its enormous

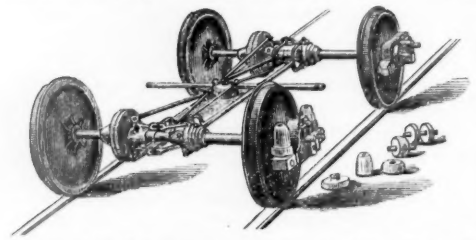
development as one of the most striking features of our civilization. The street car has become, in city life, the reliable and preferred means of personal locomotion; and like all other American contributions to the general stock of useful improvements, it has a broad smack of the democratic cast of our institutions. The common laborer and the millionaire, the smeared artisan and the wealthy proprietor, the sewing girl and the fine lady, all side by side, roll along our avenues in this chariot of the people, in equal grandeur and at a uniform fare of *five cents*. It has been ascertained that the entire population of our cities are transported in their street cars from ten to fifteen times annually. The last official report shows that the New York street railroads transported last year more than 13,000,000 passengers. The amount of capital invested in the construction and equipment of street railroads in Massachusetts, New York and Pennsylvania, is set down as follows:

Massachusetts.....	$ 5,284,199 00
New York.....	21,555,083 00
Pennsylvania.....	7,888,272 00

Changes for the better in the style of cars have kept pace with the increase of business. The latest improvements are those offered by the well-known establishment of McNairy, Claflin & Co., of Cleveland, Ohio. The above engraving presents a view of the new car complete, and we subjoin a detailed description of the improvements, from the manufacturers' circular:

The Brake.—The device, in the form of a wheel, on the axle, under the central part of the car, is in two parts: one part, next to the nearest car wheel, is a shell

or dish wheel, and is made fast to the axle; the other part is a wheel with a conical face, closely fitted into the shell or dish wheel. The two cone-faced wheels (one on each axle) are loose on the axles, and are connected by bars, as shown in the engraving. On each axle, towards the opposite car wheels, are shoulders; and between each shoulder and the cone-faced wheel are two knuckle joints, one above and one below the axle, which are operated by rods connecting them with the brake lever. When the knuckle joints are straightened, they form a brace between the shoulder and the cone-faced wheel, crowding the latter into its shell or



dish wheel; and the cone and dish wheel thus brought in contact constitute the friction surface of the brake. The parts are strong and simple and not liable to get out of order; and the large friction surface renders the brake very effective.

The Anti-Friction Journal bearing.—This bearing is formed by three inter-lapping rollers, made of chilled iron or steel, and resting on the top of the journal. The rollers are shown on the ground in the engraving. These rollers have their centre bearings in the cast iron journal casing or housing on which the car body rests. The rollers having a diameter many times that of the journal, revolve, in a corresponding degree, more slowly than the journals; and, as the journal and rollers revolve in opposite directions, the friction is reduced to its minimum. An examination of this bearing after it had been subjected to hard service for twelve months disclosed no perceptible wear on the surface of the rollers or journal, nor on the roller centre bearings. The superiority of this bearing in the amount of power required to start a car from rest, is very obvious in practice.

The Swing Motion.—This is a simple and important device. The car body, it will be seen, rests on eight rubber springs,—the springs resting on projecting shoulders of the journal casing. Passing vertically through each spring and the shoulder of the casing is a bolt, extending from the car body to the stirrup brace below. The hole in the casing shoulder has twice the diameter of the bolt; and by this simple means ample lateral play is given to secure an easy and comfortable swing motion to the car body. The value of this improvement, in reducing the wear and tear of cars and track, by preventing sharp lateral jolting, and in promoting the comfort of passengers, can scarcely be over estimated.

The Draw Head.—This consists of a series of annular rubber springs on the follower, so arranged with reference to the form of the draw head, in combination with the easy-running anti-friction journal bearing above described, as to wholly avoid the violent jerking so disagreeable usually in starting.

Railway Gauge.

Perhaps no department of railway construction has excited more attention and discussion than the question of gauge. It is a question so comprehensive, so intimately connected with the first outlay, with the subsequent maintenance, and, above all, with the profit and loss working of railway speculation, that, when considering branch lines to existing railways, or lines for new countries, too much care can hardly be devoted to the subject.

The fears at first entertained that there would be no stability without a great breadth of gauge were speedily dissipated, and we are now told that vehicles have been run over the Festiniog line of 23½in. gauge without any mishap. It is a certain fact that, for a line having, or likely to have, a traffic of a given number of tons per 24 hours, such line should be wide enough to carry that traffic without entailing a necessity for trains of an excessive length. Without attempting to lay down rigid rules on such a subject, yet we may fairly say that no train ought, if the arrangement could be avoided, to be composed of more than forty vehicles, exclusive of the engine. Let us then take each carriage or wagon at 30ft. long over the buffers, and (say) 7ft. wide over all; this will give an area of ground covered equal to 40 × 30 × 7 = 8,400 square feet, the proportion of length to breadth being 1 to 171 nearly. Such a train as this, of loaded goods wagons, would, taking each at a gross weight of 10 tons, give a 400-ton train on a 4ft. 8½in. line. To place such a train on a line like Festiniog of 2ft. gauge, we cannot have wagons wider than 4ft. 6in. with safety, and thus to make up 8,400 square feet of train, and assuming the weight to remain equal in both cases, we should have 4.5:7::1,-200=1,866ft., giving a proportion of length to breadth equal to about 1 to 415, which would become unmanageable.

The advantages of the narrow-gauge system are, that the first cost of construction is lessened in two ways; first, in the smaller section of the earthworks and the lighter scantling required in the bridges, and secondly, in that lighter rails, sleepers, and general fitting of permanent way will answer. The advantages in working the line afterwards depend a good deal on the nature of the rolling stock. The narrow gauge undoubtedly possesses the advantage, so far, at least, as the carriages are concerned, that it renders the distribution of weight over a large surface of rail a matter of necessity, if anything like a high speed is maintained; because, although a gauge of 2 ft. may be safe under certain conditions, yet it would not be wise to try a speed of 40 miles or even 30 miles per hour over it, unless the height of the centre of gravity bore a just proportion to what was found safe loading on the 4 ft. 8½ in. gauge. These conditions of working, then, would merely alter the manner of working a rail, but would not actually diminish its work. Railway men, however, know that concentrated weight is what injures a rail, and one pair of 10-ton wheels rolling over at 30 miles per hour does more damage than even three pairs of wheels, each loaded with 5 tons, moving at the same speed. It cannot be denied that, theoretically, the gauge of a line should bear a certain proportion to the work it has to perform, but here steps in a difficulty as regards feeding or branch lines; it is to the last degree important to avoid shifting loads from one track to another, because the loading and unloading of goods forms a serious item in the cost of transit; therefore, if this point is to be properly considered, there must be a uniform gauge for all the railways in the country, and to carry this out in its integrity the smallest branch line should be the same size as the main or trunk line, and if the main line requires the most skillful financing to make it pay with all its traffic, how about the branch line, which is saddled, mile for mile, with an average interest debt on capital sunk equal to that of the main line? It may, then, be asked, what should be done to get over the difficulty; on the one hand, if a narrow gauge is adopted for the branch traffic, the loads, when intended to travel over the main lines, must be shifted, or else the expenses of the branch are as great as on the main lines, and without proportionate traffic to bring in income. The consideration of this point brings us to the closer scrutiny of the construction of branch lines, a question which will by and bye force itself on our notice in railway working. While, from reasons already stated, it is essential that a uniform gauge be observed all over the country, it is not necessary that branch lines should have more than a single track; this at the very outset clears away some of the difficulties of the question. When a service of (say) three trains each way will serve the traffic, a single line is amply sufficient.

Another point, however, and one most intimately connected with the question of working expenses, will also modify matters considerably; this point is the motive power used on these branches. The wear and tear of permanent way is one directly proportionate to the weight of the engines working the line, and 80lb. or 90lb. rails are only rendered necessary by driving wheel loads of 12 and 14 tons on each pair of wheels.

Loads like these, however, are necessary to haul 400-ton trains, but are not needed to move 50 tons. The wear of a rail increases in a very rapid proportion to the increase of weight on the wheels moving over it, and a rail that would live but three months with 12-ton wheels would last perhaps two years with 6 tons concentrated load. Branch lines possess numerous advantages for profitable working that largely compensate for the disproportion between capital sunk and paying traffic, advantages which branch lines are destitute of. They do not require so large a protective staff, if we may coin a term to define signal and pointsmen and telegraph clerks. They are less exposed to expenses for compensation for accidents, and though this item, like that called bad debts, should not exist theoretically, we know it does so in practice.

Few will or can attempt to deny that a system of railway should exactly resemble a river and its tributaries, but this is a point hitherto little regarded by railway men. We have demonstrated certainly that a uniformity of gauge must be maintained, but if the matter of rolling stock be properly considered, these lines should be a profitable adjunct of trunk lines.

The mistake of working these branches, where any have yet been made is, that the same engines are put to work them that work the main line, and so long as such a system is pursued, the branches will be a source of loss instead of gain. When engines get a little old or are superseded by newer designs, these old ones are turned over to branch work, instead of being sent to the scrap heap. We may quote two examples of the system we condemn: the one is, or was in practice on the Howth Branch of the Dublin & Drogheda Railway. This branch is about five miles long, nearly straight, and, save close to the junction, very fairly level. This branch is, or was, worked with the same style of engines as were worked over the main line, the sole difference being, that they were fitted with tanks instead of tenders. The second example is to be found in the Cornwall Railway, from Plymouth to Falmouth, which is a single line, and is worked by some of the oldest of the Great Western engines; engines rediculously disproportionate to the trains they draw. The only way in which branch lines will ever be worked to a profit will be by using engines built specially for them, and which should in themselves be as light as will be consistent with the power required for the line, and having a short wheel base, and at least four wheels coupled; with such engines as these, having the load for adhesion distributed over four driving wheels, and whose total load, with tender—though tank engines would be better—did not exceed 20 tons, it would be found that branches, instead of being suckers of the main lines, would really fulfil the duty they ought to fulfil, that of feeding them.—*Mechanics' Magazine.*

The Right to Acquire Depot Grounds.

Judge Cardozo yesterday gave an important opinion in the matter of the Harlem Railroad Company. The particulars we give in the Judge's opinion, where the facts are sufficiently stated. The Judge says that freight depots, at convenient localities, are "necessary" to the operations of the petitioners' road is undeniable. The company, therefore, "requires" real estate for that purpose. To say that it can get along with a lease, is to say what is equally true respecting every foot of land over which it runs its cars; but to claim that therefore the fee is not "required" is to apply a hypercritical meaning to that term, which ought not to prevail against a corporation created for the convenience of the public, and is contrary to the plain intent of the statutes upon these subjects, which make no provision to enable companies to compel leases, but always provide for the acquisitions of the land itself. The necessity, therefore, of having freight depots and land for them, plainly existing, I think it cannot be said that the land is not required now because the lease has not yet expired, and also because the company is bound in good faith to secure for itself suitable depots before the lease expires, so that the public be not subjected to inconvenience at that time. It will not avail to say that the owner may renew or extend the lease. The company is not bound by any statute to take such renewal, or to take a lease at all. Against the theory that other lands will answer equally well, (if that were material, which I think is not the case,) is the fact that this property has long been used for just the purpose for which the fee is now sought to be acquired. Its necessity for that purpose has thus been partially established. The statute plainly contemplates that the company shall locate the lands which it needs. The motion to appoint commissioners is granted, and three gentlemen will be named by counsel.—*New York Times, Oct.* 19.

Connecticut & Passumpsic Rivers Railroad.

REPORT FOR THE THIRTEEN MONTHS ENDING JUNE 30, 1870.

This railroad extends from White River Junction, Vermont, northward to North Derby, on the Canada line, 110.3 miles. On the 1st of July last it commenced operations under a lease the Massawipi Valley Railroad, which extends from North Derby northeastward about 30 miles to Lenoxville, where it connects with the Grand Trunk Railway of Canada on the north, and through this and the Vermont Central and the New Hampshire northern roads on the south and southeast, it forms a section in through lines between Boston and Montreal and New York and Montreal. The year formerly ended May 31, and thirteen months are included in the last report in order to bring the lease of the Massawipi road up to the beginning of the current and future fiscal years. We extract the following the report:

The receipts from operations of this road for the thirteen months ending June 30, 1870, were as follows:

From passengers		$195,970 56
" freights		365,251 29
" mails		12,043 42
" express		7,340 00
" rents		4,546 05
		$585,151 32

Expenses, viz;

Road department	$168,365 39	
Rolling stock	54,176 54	
Stations and buildings	22,696 39	
Freight department	29,593 80	
Passenger department	21,613 24	
General expenses	49,683 65	
Miscellaneous	59,558 83	
		405,687 84
Balance		$179,463 48

The rolling stock consists of 15 locomotives, 11 passenger, 7 baggage, 147 box, 92 rack, 13 coal, 147 platform, 10 ore, 2 derrick, 20 gravel, 28 hand, 18 wood, 1 drovers' and 4 freight saloon cars, valued at $401,045. The value of materials on hand was $124,691.65.

There was added to the equipment during the year, 2 locomotives, 16 box, 43 platform and 21 rack cars. One rack and three platform cars were rebuilt. In repairs of track, 813 tons of new and re-rolled iron, 8,652 repaired rails, and 42,342 sleepers were used. The report says additional equipment, amounting to $79,998.23, was built at the company's repair shops and charged to construction.

Two dividends of three per cent. each have been declared, amounting to $133,326.33, including government tax.

The bonded debt of the company has been reduced $25,000.

The October freshet caused a falling off in the receipts of that month of $23,900, and the damage caused by the same amounted to $25,000. At Norwich, the bridge and abutment, thirty feet high, which were carried away, have been replaced by a deck bridge of nearly twice the length of the former one. At South Newbury, where a similar disaster occurred, the same precaution has been taken, by increasing the length of the bridge.

At Lyndon, where two bridges were carried away, the location of track was changed, making it unnecessary to rebuild. In replacing culverts and water-ways which were damaged, pains have been taken to provide as far as possible against similar freshets by enlarging.

Experience has demonstrated the fact, that a first-class road-bed is essential to economy; and not only has the road-bed been put in a better condition than ever heretofore, but the rolling stock has been kept in good condition.

The Massawipi Valley Railway was not finished July 1st, as per contract, but the main line between North Derby and Lenoxville was so far completed as to be operated with safety, and passenger and freight trains were put on that portion of the road on the first day of July. The business, thus far, confirms the opinion heretofore expressed, that the extension of the line to the Grand Trunk Railway, at Lenoxville, will add materially to the business of the whole line.

The number of miles run by passenger trains during the year was 94,311; by freight trains, 88,230; by construction and wood trains, 28,293—total miles run, 210,-834. Number of passengers carried, 122,619; do. carried one mile, 3,760,543. Tons of freight carried, 91,-907; do. carried one mile, 5,448,558.

The following are the directors of the company: Henry Keyes, Newbury, Vt.; Josiah Stickney, Emmons Raymond, William Thomas, Gardner C. Brown, Thomas Upham, Benj. P. Cheney, F. M. Weld, Boston; Elijah Cleveland, Coventry, Vt.; Henry Chase, Lyndonville, Vt.; Timo. P. Redfield, Montpelier, Vt.; Albert Knight, Stanstead, Quebec; Benj. Pomroy, Compton, Quebec. Henry Keyes is President; Josiah Stickney, Vice-President; N. P. Lovering, Treasurer; Elijah Cleveland, Secretary, and A. H. Perry, General Superintendent.

The Centre Rail System in Brazil.

The following paper was read at the recent meeting of the British Association at Liverpool by Mr. J. B. Fell, C. E.

Since the opening of the Mont Cenis Railway in June, 1868, other mountain lines on the centre rail system have been under consideration in different parts of the world. One of these lines now being constructed is in Brazil. It commences at the terminus of the Canta Gallo Railway, crosses the Serra at an elevation of 3,000 feet above the Canta Gallo line, and terminates at the town of Novo Friburgo, a distance of twenty miles. In some of its principal features this railway resembles the summit line of the Mont Cenis, the gradients for the passage of the Serra, over a distance of ten miles, being principally from one in twenty to one in twelve, and the curves by which the line winds the spurs or counterforts of the mountain being, for a considerable portion of it, from forty to one hundred metres radius. The narrow gauge of 1.10 metres has also been adopted. In other features, however, there is an important difference between these two centre rail lines. The concession for the Mont Cenis was but temporary, terminating at the completion of the great tunnel, and the railway is laid on the existing public road, whereas the Canta Gallo line will be permanent, and the works will be so constructed as to be specially adapted to its requirements. It will not have to contend with the difficulties of an Alpine climate, and, profiting by the experience of two years working on the Mont Cenis, it will have the advantage of important improvements which have been made in the engines, carriages and permanent way during that period. Consequently, the Canta Gallo, and other similar lines now being, or about to be commenced, have the interest of marking an important development of the capabilities and advantages of the centre rail system, as applied to the construction and working of mountain railways. It may be useful here to record what has already been accomplished in the task of carrying railways over mountain passes hitherto inaccessible to the locomotive, and of giving it the power of safely carrying trains of passengers and goods upon gradients and curves which would previously have been considered most perilous, and indeed impracticable. The writer will, then, point out the improvements which by experience and more mature study have been made in the application of the system to mountain railways. It had been predicted of the Mount Cenis Railway that to attempt to carry the traffic over such a line by locomotive engines would be impracticable, and, if possible, would be dangerous. We can now reply to these doubts by the result of two years and three months working of the summit line. During that period trains have run a distance of more than 200,000 miles, and have carried between France and Italy over 100,000 passengers without injury to any one of them, and, besides, have effected the transport of a considerable merchandise traffic. Since the month of September last, the Mont Cenis Railway has carried the accelerated Indian mail, without missing the correspondence by any delay on that line on any occasion; and on one passage of the mail, when late from Brindisi, an hour and a quarter of lost time was made up in the crossing of the Mont Cenis. By the service thus established, the delivery of the Indian mail in London has been accelerated on an average by about thirty hours. The ordinary mails between France and Italy have been carried by the line since its opening, and one night's traveling has been cut off the journey between Paris and Turin.

The difficulties which remain to be overcome in the working of such railways as the summit line of Mont Cenis, relate principally to some details in the construction of the engines, to the reductions that can be effected in the cost of traction and to the covered way. The first twelve engines built in France for the Mont Cenis, were so constructed that both horizontal and vertical driving wheels were worked by one pair of cylinders. The dimensions and distributions of the parts were, however, such that the movements of the two sets of wheels were not perfectly coincident, by which a certain amount of unnecessary friction and wear and tear are produced. The outside connecting rods between the rocking shafts and vertical driving wheels are placed at an angle to the cylinders, and the horizontal distance between the crank pins and the piston rod is slightly increased and diminished at the moment of passing the dead points when the engine rises and falls on the springs. As a corresponding movement cannot take place in the connecting rods of the inside gearing, a portion of the weight of the engine is thrown upon them and on the cranks, causing an increase of wear and tear, loss of power, and occasional breakdowns of the engines. In the four new engines delivered about the end of last year, these defects have been removed by working the two sets of driving wheels by separate pairs of cylinders, the result of which has been a considerable reduction in the cost of repairs, and prevention of the delays to the trains that had arisen from the breaking of the machinery. These engines have also the advantage of running at higher speed when off the centre rail, and of avoiding the wear and tear of the inside wheels and engine, from which the steam is then shut off. The compressing gear, however, is not yet perfect, as the effective pressure of the horizontal wheels on the centre rail falls considerably short of the indicated pressure, and, consequently, the tractive power exerted is not equal to that of the two-cylinder engines, although the boiler and cylinder power is greater. There will be no difficulty in providing a remedy for this defect in the engines about to be built, which will have given to them double the power of adhesion possessed by those last built for the Mont Cenis. In the latter the power is transmitted from the cylinders to the cranks of the horizontal wheel axles by a train of toothed wheels, which have worked well hitherto, but in locomotives there is no doubt that a system of cranks and connecting rods is preferable where the gearing can be so arranged. It is now proposed to dispense with the toothed wheels, and at the same time to introduce a simpler method of driving than that adopted in the two-cylinder engines, by placing the inside cylinders one over the other, and by means of cross heads, or diagonal rods, to drive the vertical axles on either side of the centre rail from each cylinder, so that when the upper cranks are on the dead point the lower cranks are on the midstroke, and the power for the purpose of passing the dead points has not to be transmitted from one side to the other, as must be the case where the cylinders are placed horizontally and the axles to be driven are vertical. The long six-wheel carriages with radial axles have been found to run more steadily and with less resistance on the sharp curves of the Mont Cenis than the short carriages with four wheels, and the dead weight to be carried is relatively less; it is therefore probable that either this or the double bogie carriage will be used on future railways when curves are admitted of two chains radius or less. The covered ways on the Mont Cenis have only partially answered the purpose for which they were intended, and considerable inconvenience has been experienced by the passengers and also the engine drivers from the want of ventilation and the heat. To remedy these defects and render the covered ways effective for the passes of the Alps, they require to be raised 3 feet or 4 feet, with chimneys at intervals, and the length of the line covered should be extended from 10 kilos to 20 kilos. The Canta Gallo Railway will, of course, require no covered ways. The permanent way will not differ much from that on the Mont Cenis, except that the strength of the centre rail chairs and fastenings will be somewhat increased. Considered in an economic point of view, the result of the application of the centre rail system to the Canta Gallo Railway will be as follows: Assuming the cost, as estimated, to be about £300,000, it would be at least double if made on the steepest gradients, say 1 in 30, on which ordinary engines could work. The cost of traction and maintenance will not be greater than they would be upon a line with ordinary gradients passing over the same country. The clear saving, therefore, effected by the centre rail system is at least £300,000, and it has rendered possible the construction of a valuable line of railway which otherwise would have been commercially and financially impracticable. Surveys have been made by the Indian Government for a somewhat similar line of railway from the port of Karwar to Hooble, in the Soutnern Mahsitta country, both by way of the Arbyle and the Kyga Ghats. The whole distance is ninety miles and there are gradients of 1 in 20 over a length of about ten miles for the passage of the Ghats. The present cost of the transport of cotton and other produce over the ninety miles is stated to be £235,000 per annum, and in addition there is the disadvantage of not being able to get the whole crop carried to the port of shipment before the rainy season commences; a large portion of it has therefore to be housed and kept till that is over.

The passages of the Bhore and Thull Ghats have cost respectively £800,000 and £500,000 for lengths of sixteen miles and nine and a half miles, or £50,000 per mile.

The length of the passage of the Arbyle or Kyga Ghats, with gradients of 1 in 37, as on the Bhore Ghat, would instead of ten be twenty miles, and the cost of £50,000 per mile would be £1,000,000, whereas the cost of the ten miles of centre rail line would not exceed £25,000 per mile for a line of 3 feet 6 inch gauge, and the saving effected would be £500,000, while in this case also there would be little or no increase in the cost of traction or maintenance.

Negotiations have been going on with the governments, local authorities and people interested for the construction of centre rail lines in Italy from the Adriatic to Macesata, and crossing the Appenines to Foligno, from Florence to Faenza, and for three branch railways in the Neapolitan States. In France, from Chambery to St. Andre du Gaz and Lyons direct, crossing the Col d l'Epine. In Switzerland for the passage of the Simplon. And in Spain for lines from Leon to Corunna and Gion.

Although the Mont Cenis Railway cannot be taken as a type of the best or most improved application of the centre rail system, it has had the effect of proving its mechanical practicability and safety when put to the most crucial test to which any new principle could be submitted.

The cost of traction and maintenance, which has been high hitherto, from causes having no connection with the system, can be considerably diminished and probably reduced to one-half. The Semmering incline in Austria furnishes an example of the economy that may be effected in the cost of traction by improvements in the engines and by good management, and there is no reason to doubt that as much may be done on centre rail lines on such inclines and mountain passes as the Mont Cenis.

The cost of traction on the Semmering in 1860, was 2.85f. per train kilo, which was reduced in 1861 to 2.40f.; and in 1862 to 1.29f.; and in 1863 to 2.15f.; in 1864 to 1.88f.; in 1865 to 1.70f.; and in 1866 to 1.49f. And it must be observed that the trains carried for 1.49 per kilo were considerably heavier than when the locomotive expenses were nearly double, or 2.85f. per train kilo.

When the concessions for the Mont Cenis Summit Railway were granted, the progress of the great tunnel justified the expectation that the summit line would carry the traffic between France or Italy for seven or ten years; but the period of working will have been three and a half years only if the tunnel line should be opened by the end of next year, as the concessions would then expire. The Mont Cenis line, therefore, being temporary, and the duration of the concessions having been reduced to one-half or a third of the period anticipated, it has the character rather of an experimental line than of a commercial enterprise. It has been the pioneer of the system, and will be followed by other centre rail lines, which will place in communication many countries hitherto separated by mountains impassable for railways worked by ordinary locomotives, and it is to these lines of the future that those who have worked on the Mont Cenis must look for the rewards of their labors and anxieties of the past.

WESTERN MARYLAND RAILROAD.

Report for the Year Ending December 31, 1869.

The Western Maryland Railroad extends from Relay House (seven miles north of Baltimore on the Northern Central Railway) westward a little more than 50 miles, and is to be extended in the same direction to Williamsport on the Potomac about twenty miles north of Harper's Ferry. It is distant from ten to twenty-five miles north from the line of the Baltimore & Ohio Railroad, and at Williamsport will be eight or ten miles west of North Mountain station on the latter road.

The road was open last year to Pipe Creek, 46 miles from Relay House. We extract the following from the annual report of the President and Superintendent delivered at a stockholders' meeting on the 19th ult. George M. Bokee, the President, says:

Since your last annual meeting the City Council of Baltimore passed ordinance No. 11, providing for the endorsement of $1,400,000 of the bonds of this company, the proceeds thereof to be applied to the construction and completion of an independent line from Baltimore to Williamsport under certain specified restrictions and conditions.

The board are happy to inform you that all the provisions required by said ordinance have been strictly complied with to the entire satisfaction of the Commissioners of Finance of the City of Baltimore, and that the first delivery of $100,000 of the bonds has been made to the Finance Committee of this company.

Your board has entered into contract with responsible parties for the construction of the entire road from Baltimore to Williamsport, at such prices as, in the judgement of our Chief Engineer, R. B. Osborne, Esq., will insure its completion within a reasonable time. A large force of workmen have been actively engaged on the heaviest portions of the line since August, and the work is progressing entirely satisfactorily. The track is now laid up to the Monocacy, and the bridge superstructure across that stream will be completed in less than two weeks, and unless some unforseen difficulty arises, the road will be in running operation to the town of Mechanicstown by the first of the year.

The report of the General Superintendent shows the number of passengers carried during the year to have been 112,862, and freight in the same time, 112,104,296 pounds; also number of barrels of flour, 28,614. The further statement is made that the trains have been running with regularity and promptness, making their proper connections, comparing in this respect favorably with those of any other road running out of Baltimore.

A remarkable freedom from accident is indicated. There has been expended on repairs of the present bed of the road during the year, in new rails, cross-ties, ballast, bridges, etc., the sum of $44,011.16.

The gross annual earnings of the road amount to $137,927.60, and the expenditures $111,794.20, showing a net profit of $26,133.40, and an increase over last year of $854.32. It is worthy of notice that whilst the income from freights, as on all roads, fell off, that derived from passenger fare materially increased.

An election for five directors to serve for the ensuing year was held, and the following gentlemen chosen: Isaac Motter, of Williamsport; John Welty, of Hagerstown; Hon. Joshua Biggs, of Mechanicstown; G. W. Harris, of Middleburg; Col. John K. Longwell, of Westminster, all of whom were in the old board, which has besides C. M. Stewart and George M. Bokee, of Baltimore.

—During the past twelve months the administration of the Dutch State lines has opened for traffic the following sections: Waardenburg to Hedel, Utgeest to Saardam, and Meppel *via* Hoogeveen, and Assen to Groningue. A bridge over the Meuse near Crevocœur, as well as other works on a line from Hedel to Bois-le-Duc, are sufficiently advanced at present to admit of the section being opened to the public in the course of the winter. The piers of the great Moerdyk-bridge are completed, and the approaches are now being proceeded with. The girders are laid between four arches, and are expected to be laid between three more before the close of the winter. The length of the line now in operation is 509 miles, and 43¾ additional miles will be completed in the course of this year.

Criticism of the Pullman Cars.

The following suggestions for improvements in the Pullman cars is from a correspondent of the *Scientific American* who was with the Boston Board of Trade on their excursion from Boston to San Francisco and back:

The excursion train of the Board of Trade, of Boston, was a success, and I desire to add my testimony to that of the party which went in the Pullman train, as to the excellence of the arrangements, which far surpassed anything I have found here or elsewhere. Considering the number of persons, the extent of the journey, the magnitude of the grades, the beauty of the scenery at several points, it may be truly said that the excursion was a great success, and stands unrivaled in the annals of railroad traveling. It must be acknowledged that Messrs. Pullman deserve much credit for their enterprise and ingenuity. At the same time, it would be a libel on their intelligence to say that improvements cannot be made in the palace cars. Having had much experience in them, and having given much thought to the subject, I trust I shall not be considered querulous if I suggest some alterations which I am sure will be considered improvements by the class of travelers who generally occupy the palace cars, and are willing to pay to be comfortable.

Taking for dimensions the actual measurment of a "drawing-room car," built by the Chicago, Burlington & Quincy road, at Aurora, Ill., namely, from buffer to buffer, 64 feet, as the standard or maximum length, and deducting 7 feet for platforms, etc., in order to get the inside dimensions, we have 57 feet. Six lengths of couches, including the partitions and one state room, at 7 feet, 49 feet, leaving for wash stand and water closet, 8 feet. The "saloon car" measures 3 feet 4 inches more. I presume this space to be occupied by the organ on one side and a linen closet and desk or secretary, on the other.

The principal defect in these cars is the want of sufficient accommodation for ablutions, etc. There are only two wash-basins for twenty-eight persons, supposing that only two occupy each section and the two state rooms. There are only two water-closets, and, as these have no water, they should be called dry-closets, or broom-closets. The next defect is in the unnecessary width of the couches for one person. They are about 40 in., which, allowing for the sides of the car, and calling the outside width 9 ft. 11½ in., leaves about 3 ft. space between the lower couches. About half of this space is taken up by the curtains when the berths are made up for the night, so that, when everybody is stowed away, a clear space remains for the conductor or servants to pass along of about 18 in., enough for that purpose, but not enough to enable one to dress in with any degree of convenience.

Now for the remedies. Discard one state room in the 64-ft. car, and put in one or two wash-basins and another water-closet, to be allotted to ladies, and in the 67-ft. car leave out the organ and secretary, and give more washing room and more closet room. Put into every water-closet a small tank and a portable basin, towels, etc., and enlarge the aperture in the seat, as well as the conductor from the seat downwards. These small alterations will add much to the sanitary comfort of valetudinarians, as well as all others. To the first they are absolutely essential.

As to the couches, if I cannot have them in the centre of the car, leaving a space for servants on each side, and assuming that a section is to lodge only two persons, I would have them only 30 in. wide, giving 20 in. more in the centre, which would add much to the comfort by day, and to the convenience for dressing in the morning, and going to bed at night.

The present couches are very badly formed for comfort by day, the seat being very hard, rounded in form, and with no convenient back or arms to rest upon. These should be upholstered with reference to the comfort of the occupants by day. Space enough should be left under the couches to stow away small valises, bags and bundles, which now occupy the limited center space, or are put away in distant closets, to the inconvenience of passengers. Now, there is only room under the couches to lose boots, shoes and umbrellas. In order to give the required room, the seat need not be raised, nor the cushions curtailed. All that is wanted is to leave off the deep ornamental facing board. More conveniences are wanted for hanging up small articles, and some better arrangement for locking the upper berth. The present handle is much in the way of the heads of those occupying the lower couches in dressing. The system of ventilation seemed to be imperfect; the occupant of the lower couch can control his window, and let in air, rain or cinders, at pleasure; but the occupant of the uppper couch gets only a modicum of air, filtered through the lower atmosphere.

Other small defects, which create a good deal of delay and dissatisfaction, are the small cocks supplying the very small basins with water, homeopathic towels, and the total absence of means for cleaning one's mouth, excepting by using the one drinking glass in the water-closet, or outside the door at the risk of one's life. I do not mean to be understood as recommending railroad companies, or Pullman companies, to supply both brushes and yard-square towels, and a tumbler for each person, with a reservoir to spit in; but I insist on the practicability and convenience of having larger cocks, two mugs or tumblers to each basin, towels at least two feet square, and a general outlet or reservoir for mouth cleaners. It is no answer to say that the traveling public don't use tooth brushes, or require large towels, and much washing, and that they can sit on a hole 8x6.

I am sure that those who make long journeys and are willing to pay to be comfortable, will fully appreciate the small things I enumerate as essential to health and comfort. It is no answer to say that there never were before such conveniences as we have lately experienced, and that if the public don't like the arrangements they should remain at home. These and similar answers are made when travelers suggest alterations; and it is also answered that to add more weight or more space would be inconvenient and costly. So far from desiring to add more weight, or more space, in width or height of cars, or more cost, I would curtail the couches and all their fittings 25 per cent. in width, and leave out much of the ornamentation, so as to reduce weight and cost, as well as the expense of occupancy.

Having touched on some of the inconveniences which all admit in the arrangements for the outward man, I must say a word as to the commissariat cars and appendages. The one I measured was 59 feet long. The amount of space, the weight and cost of the cooking room, where some stores are also kept, are far beyond the necessities or wants of the traveler, who looks most to comfort, health and economy. The attempt usually made to furnish a bill of fare equal to Delmonico or Parker, is not only a failure in quality, but a grievance in cost, and it also involves great heat in the dining car. In my experience, the cooking room was invariably in the front end of the car, so that all the heat, and bad smells, and confusion of getting through a narrow passage, in contact with servants and cooks became a positive evil. I can conceive of no reason for ventilating the cooks at the expense of the passengers, unless it be thought that the more uncomfortable they make the latter, the less they will consume.

In hot weather, on long journeys, people do not require a great variety of food. A few good and simple dishes are all one wants, with good hot coffee, bread and butter, ice and water. In our California journey, the tables in the dining car, about 3 ft. by 2, were expected to seat four persons, and there was room enough for simple, well-cooked food, but not enough for the long list of half-cooked vegetables, meats, pies, puddings, jellies, pickles, etc. The tea and coffee were poor, especially the tea, the bread very good, and the attendance unexceptionable. My remarks must be considered as applying mainly to the drawing-room cars. The saloon cars are perhaps more convenient for small parties, being more private, but they also suffer from want of washing conveniences.

The California Pullman train was too long for comfort or safety—about six hundred feet, and nearly double the weight of an ordinary passenger train containing the same number of passengers, hence considerable delays were inevitable, which added to the delays from hot journals, consequent to a new train, made the journey longer by a day, each way, than will generally be necessary to go from the Atlantic to the Pacific.

Central Shaft—Hoosac Tunnel.

At last, after years of toil, and at a cost of close upon half a million of dollars, the great central shaft of the Hoosac has reached the grade of the tunnel—1,030 feet below the natural surface. This shaft is elliptical, the transverse diameter being 27 feet, and the conjugate 15 feet passing the entire depth through a compact mica-slate formation intermixed at intervals with white quartz. At the commencement of the present contract with the Messrs. Shanly, there required to be done 447 feet. This has been accomplished since June 1, 1869—say in 15 months—giving a monthly average of 29.8 feet. The largest month's work was 38 feet. At intervals of about 18 feet are floors of heavy timbers, supported by "hitches" cut in the rock, connected by ladders, in case of accident to the hoisting apparatus, and forming supports for the wooden "guides," in which the crosshead travels, under which is suspended the boiler-plate iron bucket of a capacity of about 400 gallons. The work has been impeded slightly by water, of which the shaft makes nearly three inches per hour. To raise this water, an engine of sixty-horse power is constantly working, pumping all the water which collects as far down as 650 feet, caught in tanks by sloping "drip roofs." Below this, the water on the bottom has been hoisted in the iron bucket, a bucketful being sent up by the miners whenever the quantity became inconvenient. Now, the shaft being at grade, a "sump" will be sunk, and a water bucket with bottom valve used, thus avoiding the tedious task of bailing into the bucket by hand.

Workmen are now employed trimming the sides of the shaft, and preparing the "guides" for a wooden cage to be substituted for the bucket so soon as the "headings," east and west, at the bottom, are sufficiently advanced to use rock cars, when the rock will be raised to the top direct from the headings, cars and all.

The shaft being at grade necessitates, probably. the most delicate and responsible professional act an engineer may ever expect to meet, it being necessary to lay down a line less than 27 feet in length at the bottom of a dripping dark shaft 1,030 feet deep, so that both ends of the line being produced shall coincide with the terminal points of the tunnel, each being distant over 12,000 feet from the center of the shaft. To increase the initial difficulty, the top of the shaft is on the summit of a ragged mountain, from 1,500 to 1,800 feet above the grade of the tunnel at its terminus. It is no light responsibility to assume charge of this operation. The State of Massachusetts has had manufactured a colossal transit instrument of the most elaborate and perfect construction, costing $3,000. The most accurately verified lines have been laid down over the mountain, extending long distances beyond in both directions to the tops of neighboring mountains. By the accuracy of this instrument and its manipulation, the line of 27 feet (the transverse diameter of the shaft) will be permanently defined, requiring wonderful exactness, and from its extremities the "plummet" alone can reach the bottom of the shaft. These plummets must of necessity be weighty and beautifully poised, and will require to be suspended in oil to produce perfect rest and protection from the faintest vibration of the air. The most delicate cords, consistent with strength, must be used to suspend them, and after all is done that science can suggest (being perfect as to theory) any intelligent mind can understnnd how delicate and fraught with danger the practical part of the operation to the engineer, and what grave effects the slightest error would produce on so small a base as 27 feet. It is quite possible the motion of the earth may effect the plummets more or less; but this point has not yet been thoroughly investigated.

The details of working in this shaft, and otherwise about the tunnel generally, would require a series of articles, but the above remarks may be of some interest, and suggest the difficulty last noted, giving civil engineers something to think over.—*Scientific American.*

A New Route Between the East and the West.

The proposal to bridge the Hudson at the Highlands, the objective points being Fort Clinton and Anthony's Nose, which was made about three years ago, was received with much favor at the time, but at the outset a great difficulty presented itself, from the fact that no connecting railroads existed by which the bridge could be made useful. Gen. E. W. Sherell, being consulted, declared the bridge quite feasible, but expressed doubts, at first, at finding a practicable railroad route across the mountains west to the Erie Railway; but on examination, he found that could be done, and at once a company was formed and a charter obtained. Operations, however, had to be delayed, to allow of the formation of other companies to construct roads connecting with the proposed bridge. This was done, and they have all lately been consolidated, and will commence work very soon.

Immediately after the granting of the charter for the bridge company, another company was formed and chartered under the name of the New England Railway Company, with power to constrnct a road from the Erie Railroad *via* the bridge to the Connecticut State line. Subsequently it was found that the capitalists, both here and in Europe, desired the consolidation of the two in one corporation, which was accordingly effected late in the last session of the Legislature, At the same time the limit previously assigned for the completion of the work was extended five years, As it was also necessary to consolidate with other railroads in this and other States, negotiations were entered into, and resulted favorably in the cousolidation of the Hudson, Highland Bridge & New England Railway Company with few other projected roads and two now in course of construction. This result was accomplished quite recently.

The railroads which are thus in connection with the bridge company, in the East, are, one from Derby to New Haven, the charter for which was granted by the Connecticut State Legislature about three years ago. A road was then being built from the State line to Derby, thus connecting New Haven with the State line by one continuous line, thence by the New England Railroad with the bridge. Another road was being built from New Haven to Willimantic. These are the only roads on the East which at present are projected to be in direct communication with the West *via* the bridge. In the West a road was chartered in the State of New Jersey, running from the Pennsylvania State line through New Jersey to the line of this State, thence to be connected with the bridge,and another line is to be built from the State line of New Jersey, near Milford, to connect with the Danville & Wilkesbarre Railroad, running through the heart of the coal regions, and saving, from the East to Erie, Penn., by way of the bridge, a distance of 100 miles; all being in almost direct communication with Harrisburg and Pittsburgh, Penn. These roads, with minor cross connections, will give to the East direct communication with the entire West, while it will give to New York, by way of the Hudson River & Harlem roads, direct communication *via* the bridge, with the entire West.

The roads which will be connected by the New England Railway and the bridge are, briefly, (independent of cross connections,) every road running north, west and east from New Haven in the East and in the West, the New York & Erie, the New York & Oswego Midland, the proposed extension of the Eastern Pennsylvania, and the proposed road through New Jersey and Pennsylvania to Wilkesbarre, thus forming by far the shortest route from the East, and from New York City, to the West, and to the Union Pacific Railroad, either by way of Pittsburgh by the Sunbury & Erie and the Atlantic & Great Western railroads. Another important connection will be that with the New York & Boston road, now being rapidly constructed, and which will intersect the Boston, Hartford and Erie road at Brewster's, on the Harlem road, running thence through by Carmel and Lake Mahopac, crossing the Bridge Railway at Somers, in Westchester county, bringing the Boston, Hartford & Erie road in connection with the Erie road at least forty miles less distant than by the present route.

The advantages to New York by this system of railroads connected by the Hudson Bridge are obviously very great. Passengers and freight, whether coal or merchandise, could be run directly to and from the city without ferriage or change, saving greatly in time, labor, expense and annoyance. Turner's, on the Erie road, which may be considered the objective point of the two lines, is the same distance from New York by Jersey ferry and Erie Railroad, effecting at least a saving of two trans-shipments and ferry.

The work will, without doubt, be actively engaged in very shortly, as the company have already bought up nearly all the right of way along the proposed routes of railroad, and are now making preparations for work. —*New York Times.*

—At a meeting of the Cleveland Board of Trade last week, resolutions were passed favorable to the early construction of a ship canal, with a capacity equal to the passage of vessels of 1,500 tons burden, to connect Lakes Erie and Ontario. Competent engineers estimate the cost of the proposed work at $5,500,000.

General Railroad News.

OLD AND NEW ROADS.

Albany, Sand Lake & Stephentown.

Articles of association of the Albany, Sand Lake & Stephentown Railway Company were filed in the office of the Secretary of State of New York, on the 1st of October. This road is to be constructed from East Albany to the Massachusetts State Line, in the town of Stephentown, a distance of thirty miles, to connect with a road which is in contemplation in Massachusetts, leading to and through the Hoosac tunnel. The amount of capital stock of the new road will be $500,000. The following are the directors: James Aken, Albert R. Fox, Collins Arnold and Eber W. Carmichael, of Sand Lake; George Maguire and W. C. Prankard of Brooklyn; William E. Pratt, of Washington, D. C.; George Ellis, of Tarrytown; James K. Averill, Horatio F. Averill, Walworth D. Crane, Mahlon S. Frost, and Robert B. Almy, of New York City.

Troy & Susquehanna.

Articles of association of this company were filed in the office of the Secretary of State of New York on the 15th of October. The road is to be constrcted from the city of Troy, N. Y., to intersect the Albany & Susquehanna Railroad at Knowersville, Albany county, a distance of twenty miles. Amount of capital stock, eight hundred thousand dollars. Names of directors: Joseph W. Fuller, John A. Griswold, James Forsyth, Hannibal Green, Daniel Robinson, Chester Griswold, William Kemp, J. Townsend Burden, Charles W. Tillinghast, Francis S. Thayer, G. Parish Ogden, Uri Gilbert and Walter P. Warren, of Troy.

Chicago & Michigan Lake Shore.

It has been decided to construct a branch of this road from Holland northeastward to Grand Rapids, a distance of about 30 miles. In connection with the main line and the Michigan Central this will form the shortest line possible between Chicago and Grand Rapids.

Louisville, New Albany & St. Louis Air Line.

The contract for construction of this road from New Albany to Mt. Carmel, Ill., has been let to Chamberlain, Mathews & Co., of Lalowa, O., to be completed by January, 1872, The six miles from New Albany is through rocky bluffs, though there will be one tunnel half a mile long and probably one other shorter one. The work this winter will be confined to this section, which is very heavy. The road will connect with the St. Louis & Southeastern at Mt. Carmel. From Princeton to Mt. Carmel the road is completed. Chamberlain & Mathews' contract includes grading, bridges, ties and track.

Baraboo Air-Line.

The stockholders in this company are called upon by an advertisement in the Baraboo *Republic* to pay up the second installment on their stock, and notified that otherwise they will forfeit it. It is not expected that this installment will be paid, and the call is made only in order that the stock may be forfeited legally and the company controlled by the parties who are providing means for the construction of the road.

The Lodi *Journal* of the 20th ult. says:

"We are pleased to notice the progress in the grading of the Baraboo Air-Line Railroad between this place and Madison, a portion of which is completed, ready to receive the rails and rolling stock. Sections 1 and 2 of the road, adjacent to Madison, are already completed, and the balance in process of rapid completion, Messrs. Young & Co., Whalen & Pike, Mr. John F. Robinson and Mr. John Kelly each being engaged with a large force of men and teams, on sections 3, 4, 5, 6, 7, 8 and 9 of the road. Sections 10, 11, 12 and 13, very heavy work, are under the immediate superintendence of the original contractors, Messrs. Fox & Howard, of Chicago, about 175 teams and 300 men being engaged at work on the above sections. The quantity of work on these sections amounts to about 300,000 cubic yards, most of which is already completed, having been done in the almost incredible period of twenty-five days."

The Madison *State Journal* says of the progress of this work: "In and about the city a great deal has been accomplished. The pile driving on Monona bay is nearly completed, and that across the lake north of the Milwaukee track is making good progress, though it is necessarily slow work. The grading south of the city is going forward well, though there is a large amount of filling across the marshes, which takes time. From the depot grounds to the "sugar bush" north of the city, the grading is all completed except the crossing of the Catfish. The heavy cutting at the hill near the Hospital for the Insane will delay operations some time, but the contractor is putting it through as fast as possible. There are some 800 men hard at work between here and Lodi, with hundreds of teams, and more of both, particularly the latter are wanted."

North Shore Railroad of Long Island.

Articles of Association of this company were filed in the office of the Secretary of State, of New York, on the 21st of September. Amount of capital stock five millions of dollars. Length of road one hundred miles, to commence at Jamaica and run through the villages of Manhasset, Roslyn, Glen Cove, Locust Valley, Oyster Bay, Cold Spring, Huntington, Centreport, Northport, Middleville, Smithtown, Stony Brook, Port Jefferson, Bating Hollow, Southold, Greenport, Marion and Orion—also a branch from Jamaica to Newtown Creek. The directors are: Daniel D. Remsen and R. W. Leavitt, Flushing; Charles McAuley, Thomas A. Wellford, John P. Smith, R. W. Adams, Wm. B. Maben, Henry Holcomb, Howell Smith and Francis Weeks, of Brooklyn; Robert Rodgers, of Huntington; John B. Stratton, of Ringewood; and Ogden P. Pell, of New York city.

Crawfordsville & Camden.

Cars are running on this new Indiana Railroad from Colfax, a station on the Indianapolis, Cincinnati & Lafayette Railroad 19 miles southeast of Lafayette, to Frankfort, the county seat of Clinton county, which is ten miles northeast of Colfax. The road has been graded from Colfax southeast to Crawfordsville, fifteen miles. Laying the iron has commenced, and cars will be running between those two points by Christmas. The northern section of the road is to extend from Colfax due north 25 miles to Camden, which is about fifteen miles southwest of Logansport.

St. Louis & Southeastern.

The track has been laid on the Northwestern division of this road as far as Mt. Vernon, 76 miles from St. Louis. Trains were expected to run over this portion of the line this week.

Madison & Portage.

President Campbell announces that this road is nearly completed from Portage to Paynette, 22 miles. The grading is nearly finished between Paynette and Madison, and before 1871 it is expected that the cars will be running over the entire line.

Superior & State Line.

The Superior (Wis.) *News* says: "The survey of the State Line Railroad, from Superior to an intersection with the Northern Pacific Railroad, was completed last week. The junction with the Northern Pacific was made at the point where the road takes a direct westerly course from the Lake Superior & Mississippi Railroad. The distance from here to the junction is 22½ miles. From Duluth to the same point by rail is 27 miles."

Athol & Enfield.

Work on this new Massachusetts railroad is progressing very rapidly, and hands are completing the grading at the terminus in Athol. There is every prospect the rails will be laid before the snow falls.

European & North American.

Mr. G. K. Jewett, the President of the New Brunswick company, says that there are between five and six hundred men at work grading the line in the State of Maine; and it is expected that the grading will be completed by May or June next. The line is already finished from St. John to the Maine frontier, and the part now in progress will complete the connecting link between the railroad systems of New Brunswick and the United States.

Milwaukee & Northern.

One mile of rails has been laid on this road. The directors will leave nothing undone to have the road in running order between Milwaukee and Cedarburg before the winter sets in. The survey to Green Bay and of a branch to Appleton has been completed and favorable routes found.

Green Bay & Lake Pepin.

About fifteen miles are ready for the iron, and it will be laid at once. The road will be completed to New London in a short time.

Portage, Winnebago & Superior.

The financial agent of this company and other gentlemen associated in the enterprise, are making a personal examination of the route from Doty Island to Stevens' Point. Judge Reed states that the road will be built entirely independent of existing and competing railroads, and without unnecessary delay.

Cincinnati Bridge.

The St. Louis Merchant's Exchange last week passed the following resolutions in reference to this proposed bridge at Cincinnati:

Resolved, That we, the merchants and citizens of St. Louis do hereby declare that we recognize the necessity for the construction of bridges across navigable rivers, and are not opposed to their construction, but being fully convinced that bridges can be constructed which will not obstruct or endanger navigation we do hereby most earnestly enter our protest against the authorizing by Congress of such as will obstruct or endanger navigation.

Resolved, That believing that the bridge, now in process of construction by the New Albany & Cincinnati Bridge Company, will materially obstruct and endanger the navigation of the Ohio river, thereby largely increasing the cost of transportation of coal and other articles of commerce, we hereby urge that its construction, as proposed, be prevented if possible, or that Congress shall require such changes in the same as the interests of navigation require.

Burlington & Missouri River.

This company has built at Burlington in connection with its land department a large house for the accommodation of immigrants and other land-buyers, with separate apartments for people of different nations, and agents who can talk with them in their several languages.

Mississippi & Missouri Air Line

This company have, according to the St. Louis *Journal of Commerce*, graded forty miles of their line, beginning at Quincy, and also have purchased 9,200 tons of rails to be delivered as follows: 1,500 tons in October, 500 tons in November, 750 tons in December, 750 in January, 1,000 in February, 1,000 in March, 1,000 in April, 1,000 in May, 1,000 in June, and 700 in July. The company has now two 18-ton engines, and will have two others by the 1st of December. Passenger, baggage and freight cars are all contracted for—made principally by Woodward & Co., St. Louis. The Lewis Iron Works, of St. Louis, supply the spikes, fishbars, bolts, frogs and switch-stands. The ties are being distributed along the track. The track layers are ready, and on the arrival of the material, will go to laying the iron from Quincy to Canton, and thence out toward the objective point.

New Georgia Railroad.

The Georgia Legislature has lately granted a charter for building an east and west road between Savannah, Georgia and Eufaula, Alabama, passing through Americus, in Sumter county.

Arkansas Railroads.

A correspondent in Little Rock writes to us as follows:

"I notice in your last issue under the head of Arkansas Railroads, a statement that the Little Rock & Fort Smith Railroad was completed to Lewisburgh, a distance of 35 *miles*. The road is complete to Lewisburgh, but the distance is 50 *miles*. The road is graded for a distance of 50 miles beyond Lewisburgh and ready for iron. Work is under way for a further distance of 20 miles, and the whole road will be completed to Fort Smith, 155 miles, before next fall. All except the first 20 miles is laid with fish plates. The Cairo & Fulton Railroad is completed for 20 miles north of Little Rock and ready for the iron. The steamboat Colossal, belonging to the Fort Smith road, is constantly engaged in bringing iron for both roads. Col. A. P. Robinson is Chief Engineer and General Manager of both the Cairo & Fulton and the Little Rock & Fort Smith railroads as well of the Arkansas Western Railroad.

"At a meeting of the stockholders of the Arkansas Western Railroad Company held at Van Buren on the 22d of October the following gentlemen were elected directors: Benton J. Brown, James O. Churchill, Luther C. White, John B. Ogden, Asa P. Robinson, Edward Wheeler, Wm. P. Deuckla, Daniel C. Wheeler and John H. Haney. Each receiving 55,320 votes. The Board of Directors will, it is understood, in a few days elect officers and will then be ready for active operations.

"I should add perhaps that both the Cairo & Fulton and the Little Rock & Fort Smith railroads are being built by Mr. Warren Fisher, Jr., Josiah Caldwell and associates, 'Boston capitalists.' We will commence running to Lewisburgh in a few days. Have a full complement of rolling stock—three locomotives on the road already and five more on the way."

Aid to Nebraska Railroads.

On the 18th ult. Lancaster county, Neb., (in which Lincoln is situated) voted $125,000 to the Omaha & Southwestern Railroad, $100,000 to the Nemaha Valley, Lincoln & Loup Fork Railroad, (Rulo to Columbus), and $150,000 to the Midland Pacific (Nebraska City to Lincoln.)

Missouri, Kansas & Texas.

The Leavenworth *Times* says the southwestern extension of this company's line is projected to run through the Indian Territory and "across Old Mexico, through the States of Tamaulipas, Nuevo, Leon, San Luis, Zacatecas, Guadalaxara, Jalisco, and to the Bay of San Blas, and is estimated to be 1,000 miles shorter than any other running or surveyed line from the Pacific Ocean to New York. The most northern line of this thoroughfare will pass from Chetopa to Sedalia."

Denver & Boulder Valley.

This contemplated road branches off from the Denver Pacific, at Hughes' station, 28 miles north of Denver, and will run west to Boulder City and the Grand Island district, in which are the rich silver mines. The first

section of the road, which is under contract to be built within the next 45 days, stretches to the "Austin coal mines," a distance of fifteen miles from Hughes' station. A contract has been made by Mr. Robert E. Carr, of St. Louis, for the rails to iron the road. The rails are of English iron, and the purchase was made by Mr. Carr from parties in New Orleans.

Harlem Railroad Improvements.

Travelers by the Harlem and New Haven railroads recently have expressed great relief at the improvement made in the lower tunnel. It extends from Thirtieth street to Forty-second street—a distance of twelve blocks—and has always, until the present time, been a dreaded intermediate passage, reeking with filth in wet or wintry weather, and always abounding with vile, pestilential odors, beside being almost as dark as Egypt. Mr. Vanderbilt has caused it to be thoroughly whitewashed, the sluice-ways on either side to be filled up, and the road-bed raised, covered with fresh sand, and paved with cobble stones over its entire extent. Circular apertures have also been cut through the top of the arch at intervals of fifteen feet, admitting light and air. At Thirty-sixth street, the center of the tunnel, a large slice has been taken out of the arch, and handsome granite stairways erected on either side, giving convenient access from the Madison avenue and Central Park cars, of the Fourth avenue line which now run through there, to the streets above. Similar stairways have also been placed at Thirty-fourth and Fortieth streets, a great accommodation to the residents of Murray Hill, who formerly were obliged to walk either to Madison or Third avenues—quite out of their way—for a stage or car. The tunnel is now not a disagreeable underground route. Extensive repairs are also in progress on the several stone walls along the route. At Thirtieth street a new wall is being built just below the tunnel's mouth, and will replace the unsightly one just demolished. The hideous rickety board fences are to be removed, and a handsome iron railing surmounting the stone work, is to be a most desirable substitute. The causeways leading to the upper Eighty-sixth street tunnel have been under repair during the past two years and the work yet progresses. Handsome and substantial hewn stone walls, four feet thick at the base, and rising to the street level—in some cases a height of sixteen feet—are capped and finished by an iron railing. For a long distance the deeper positions have been over-arched into a tunnel by solid brick-work. Altogether, nearly a mile of wall-work has been done. The repairs upon the truss and stone high bridge at Ninety-fifth street, which continued during the summer, are nearly completed. The stone piers for the great new iron bridge over the Harlem river are ready for the superstructure, which will soon be built, without interrupting the business of the roads at all.

The connecting links of rails girdling the river's bank, from Mott Haven to the Spuyten Duyvil Junction of the Hudson River Railroad, will be in regular order for regular trains in March—perhaps sooner. These improvements are of incalculable benefit to the roads and to the traveling public, and involve an immense expense.—*New York Times.*

Geneva & Clintonville.

The construction of a railroad has been commenced from Geneva, the county seat of Kane county, northward through St. Charles to Clintonville, which is on the Galena Division of the Chicago & Northwestern, three miles south of Elgin. This, in connection with the Northwestern's Fox River Valley road, the Chicago, Burlington & Quincy's new line south from Geneva, will complete a line along Fox River from its mouth to the Wisconsin line.

Quincy, Alton & St. Louis.

According to the Quincy *Whig* this company have made arrangements for building 40 miles of their road, from Quincy to a point on the Mississippi river opposite Louisiana, Mo. The contract for the construction has been let to Wood, Wright & Co., of Pennsylvania.

Chicago, Danville & Vincennes.

Tracklaying on this line has been resumed, and the road is completed to St. Anne, Kankakee county, eleven miles south of Momence.

Omaha & Southwestern.

This company has commenced driving piles for the foundations of a bridge across the Platte River at its present terminus, by which it will complete a connection with the Burlington & Missouri River road at the station called Omaha Junction, which is nine miles west of Plattsmouth. Cars can then run through between Omaha and Lincoln.

New Orleans, Mobile & Chattanooga.

This line was completed between New Orleans and Mobile on the 29th ult., and a train ran through the same day. It will be operated in connection with the Mobile & Ohio Railroad as a route between New Orleans and the North, and passenger trains will run through between Columbus, Ky., and New Orleans.

Central Pacific.

On this company's telegraph line a great reduction of rates has been made lately. A ten-word message from Corinne to San Francisco nowcosts only 75 cents, or seven cents per word per thousand miles. The rates to other points are in about the same proportion.

Memphis & Little Rock.

At a meeting of the directors of the Memphis & Little Rock Railroad, held in Memphis on the 29th ult., arrangements were made for putting a thousand additional hands on the road at once, in order to complete it. Warren Fisher, and other capitalists of Boston, were expected to arrive soon to perfect arrangements for the early completion of the Little Rock & Fort Smith Railroad, in which they are largely interested.

Illinois Farmers' Railroad.

The grading is completed on this line, and cars will be running in a few days from Jacksonville southeast 18 miles to Waverly.

Chester & Chicago Branch.

This road has three miles graded, and will be completed within eight months. The western terminus on the Mississippi River will be at a point three miles below Chester, Ill., and the length to the coal field fourteen miles.

Mazomanie & Sauk City.

The people of Sauk City, Wis., have appointed a committee to confer with the Milwaukee & St. Paul Railway Company, and learn upon what terms they will construct a branch line to that place from Mazomanie or a point near that station, which is 22 miles west of Madison on the Prairie du Chien line. Such a branch would be about eight miles long.

Burlington & Southwestern.

Iron is *en route* for this railroad, which is expected to be in working order into Van Buren county, sixteen miles west of its junction with the Burlington & Keokuk line near Fort Madison, some time in December.

Burlington, Cedar Rapids & Minnesota.

The iron to complete the link between West Liberty and Cedar Rapids, Iowa, on the Burlington, Cedar Rapids & Minnesota Railroad, is being received at Burlington. The *Hawkeye* says the track-laying is being crowded with all possible dispatch, and there is every reason to suppose that the whole line from Burlington to Cedar Falls (170 miles) will be in operation early in December.

Sabetha, Pawnee & Lincoln.

A company of the above title has been organized to build a road from Sabetha, Nemaha county, Kansas, crossing the State line between Kansas and Nebraska at a point not more than one and a half miles from Sec. 36, Township 1, Range 12, passing through Pawnee, Johnson, Gage and Lancaster counties, and the towns of Cincinnati and Pawnee City to Lincoln, in Nebraska.

Union Pacific.

The Omaha *Herald* claims that the managers of the railroad lines between Chicago and Council Bluffs have finally determined to establish a union freight depot in Omaha, which would make that city their terminus instead of Council Bluffs.

Wilmington, Charlotte & Rutherford.

A difficulty has arisen in the management of this company, the details of which will be found in another column of this journal, under the heading of "Elections and Appointments." The company have 130 miles of road in operation, from Wilmington, N. C., northwest to Lilesville, which is about 20 miles north of nearly the centre of the southern boundary of the State. Between that point and Charlotte, about 60 miles, some work has been done. The grading is completed from Charlotte to Shelby, 45 miles, and about two-thirds finished between Shelby and Rutherfordton, 27 miles.

MECHANICS AND ENGINEERING.

Southern Minnesota Railroad Machine Shops

The Wells *Atlas* says of these shops, which are nearing completion: "The outer walls, besides the open space for engine stalls, are 475 feet in length, and eighteen inches thick. They will be 15 feet high at the back, and 22 at the front. The door sills are blue limestone, the window sills iron. The machine shops proper are 64x182 feet.

"One hundred and fifty thousand dollars have already been expended for machinery. A large addition is to be put up next summer. It is proposed to build everything in the shape of rolling stock, from a hand-car to a locomotive. The shop will be in full operation in a few weeks."

The Buffalo Bridge.

The third caisson of the international bridge had, on the 23d ultimo, been moved very nearly in position and sunk to a depth of eighteen feet. During the night a hard wind tore it from its fastenings, and it was swept down the river nearly half a mile. Two watchmen were on the caisson at the time, and report that the structure touched bottom and swung around three times during the downward trip. All this occurred in about the middle of the night. The two watchmen were rescued in the morning. The caisson lodged near the Canada shore at a point opposite the Fletcher Blast Furnace, having grounded in twenty feet of water. Two barges were floated alongside of the crib as soon as possible, and the heavy structure, which is twenty-six feet in height, and weighs over eight hundred tons, was lifted up bodily two feet. Four tugs are at work, and it is probable that the leviathan is before this restored to its position.

An engineer writes to us: "The Phœnix Iron Company a short time since succeeded in getting a contract to build the great International Bridge between Buffalo and Fort Erie in Canada from an English company, with English engineers and English capital, competing with all the English bridge-builders. This bridge may be considered to stand on neutral ground (or rather water), as there is no duty to pay on this bridge, on either side."

Tobey's Bridge Signal.

A safety signal of Mr. Tobey's invention has been lately applied to the draw of the Kansas City bridge. The St. Joseph Gazette says of it:

"On each end of, and about 300 to 350 feet from, the swinging span, a platform has been erected, standing about 20 feet high. Near the top of this platform a red arm or lever has been fitted together with a large and powerful reflecting lamp weighing at least sixty pounds, and said to be the largest signal lamp made. This lamp turns upon a pivot, showing either a red glass or a white one. The thickness of the glasses is 2½ inches, and when lighted casts a flood of light each way, visible on a straight line fully twelve miles. The arm or lever is used for day signals and the lamp for night. The signal is so constructed that the bridge cannot be opened without turning on the signal of 'danger.' This is done by means of a huge lock or bolt, that secures the bridge. In order to unlock this immense lock, a bolt is drawn, then the 'key lever' is applied and turned in a half circle; this draws the bolt, holding the bridge at the same time, by means of long steel cords on pulleys and wheels, turns the lamp upon its pivot, and throws out the red arm of 'Danger!' One man attends both ends of the bridge, being enabled by means of the long steel cords connected with the lock to regulate each of the distant signals. These signals are complete and cannot fail to insure complete safety so far as the drawbridge is concerned."

The Omaha Bridge.

The tube on this side is now resting on a solid foundation, a rock bottom having been found on Monday night. The workmen are still kept at work digging, however.

This work is being done by a curious process. An engine is kept at work pumping air into these tremendous cast-iron tubes, which air forces the water back into the earth at the bottom, so that men can dig inside the tubes with perfect ease and safety.

We were shown the manner in which the work is done by the engineer in charge of the engine at the first tube on this side. We stood on the flat top of the huge mass of iron, and were astonished at being told that inside this tight-air compartment six men were digging, and filling canvass bags with earth and stone forty feet below us; and as we talked, the engine with its puff, puff, puff, was sending an endless stream of air into the tube, which forced the water back into the earth.

As an example of the tremendous power of compressed air, the engineer told us that the circular door which closes the top of the tube might be unfastened, and yet would remain in its place, being held up by the force of the air underneath. The door is cast-iron, and weighs about five hundred pounds.—*Omaha Herald, Oct.* 27.

A Scotch Steam Brake.

The following is a description of the method of applying brakes by steam, for which a patent has been sought by J. Sterling, of Kilmarnock, Scotland. It appears to be somewhat similar to one tried in Chicago about a year ago: Steam from the locomotive boiler is used, and is conveyed by suitable piping under the carriages or wagons into cylinders, with one or more of which each carriage or wagon is provided. Each cylinder is fixed to the framing in a vertical position, and its piston rod is connected to the brake levers or wipers, the brakes being applied by admitting the steam under the piston to lift it. An escape valve is fitted into the bottom of each cylinder, and is loaded by a spring or or otherwise to a pressure which, taking the area of the pision into account, is considered the maximum to which the brakes should in each case be subjected.

India Rubber in Car Wheels.

Mr. Robert F. Fairlie, of London, famous for his locomotives, has applied for a patent on an appliance described as follows:

The inventor forms the rim and tire of an ordinary railway engine or carriage wheel of considerable breadth to receive an india-rubber ring or tire, which must be of sufficient section to sustain the weight brought to bear on it. The metal tire the inventor forms with a small additional flange on the outer edge to keep the india-rubber tire on the wheel, the ordinary flange being provided at the inner edge to keep the wheel on the track. He, however, makes the flange of considerably greater depth than usual, as the india-rubber tire, even when compressed on the rail by the weight of the vehicle, occupies a portion of the depth of the flange.

Proportion of Brake Power to Train Speed.

A train running at a speed of 45 miles per hour, or 66 ft. per second, has a velocity equal to that which would be acquired by a body falling freely from a height of 67.6 ft.; and thus for each ton of the train's weight there is stored up in it 67.6 foot-tons of "work" which have to be overcome before the train can be brought to a stand. The train to which the accident happened probably weighed altogether about 126 tons, and thus, when moving at the speed of 45 miles per hour, there would be stored up in it $126 \times 67.6 = 8,517.6$ foot-tons of "work" to be overcome by the friction of the brakes. The brake power available consisted of the tender brake, the brake on the front guard's van, and the continuous brake fitted to the rear guard's van, and the two first-class carriages adjoining it. Taking into consideration that the driving wheels of the engine could be checked by reversing, there was probably altogether about 31 tons of adhesion weight at the front end, and about 22 tons at the rear end, which could be made available for checking the train, or, say, 53 tons in all. The retarding power which could be brought to bear would vary, according to the state of the rails, from about 1-5th to 1-10th this weight, or, say, from 10.6 to 5.3 tons. It being supposed that four seconds elapse between the time of the signal being seen and the application of the brakes, and the speed of the train being 66 ft. per second, it follows that the 435 yards, or 1,305 ft., would have become diminished to $1,305-(66 \times 4)=1,305,264=1,041$ ft. before the brakes are fairly in operation. Dividing the amount of work stored up in the moving train—namely, 8,517.6 foot-tons—by this distance we get $\frac{8517.6}{1041}=8.19$ tons, as the amount of retarding force it would be necessary to employ in order that the train might be brought to a stand by the time it reached the signal. It will be seen by this that although in fine weather it would have been possible, under the circumstances we have supposed, to stop the train within the distance with the brake power available, yet in bad weather it would have been impossible, while we may add that if the speed of the train had been taken as 55 miles per hour instead of 44, the result would have shown the brake power to be insufficient to pull up the train within the distance, even under the most favorable circumstances. We have in the above calculations made no allowance for the resistance offered by the air, or by the friction of the train, as these amounts would be approximately balanced in the case in question by the slightly falling gradient.

OLD AND NEW ROADS.

Continued from Page 128.

Boston, Hartford & Erie.

This road was to be sold by order of court to satisfy the mortgages on the 2d inst., but before the time of sale an order from Judge Ingraham postponed the time of sale until an appeal taken from Judge Barnard's order dissolving the injunction can be decided.

St. Louis & Fort Scott.

Mr. A. W. Maupin, President of this company, has this week published a card addressed to the citizens of St. Louis, in which are the following statements concerning the company's progress:

"Fifty miles are already located, the right of way secured, the profile and maps made out in full, and everything ready to break ground. A full corps of engineers are in the field pushing forward the remainder of the line to the western terminus—Fort Scott.

"The company have effected a negotiation of $5,500,000 as a basis to construct and equip the whole line. The amount required to complete the entire road from St. Louis to Fort Scott, and fully equip the same, will be about $8,500,000.

"We are assured by the people of Franklin, Gasconade, Maries, Miller, Camden, Hickory, St. Clair and Vernon counties, in this state, and Bourbon county, in Kansas, that at least $2,000,000 will be subscribed towards aiding this road by these counties, leaving $1,000,000 to be subscribed by the county of St. Louis. We feel that this company have a larger substantial basis than has ever been accomplished by any railroad company in this State."

Bridgeport & Bedford.

This is a line in Bedford county, Pa., from Bridgeport, a station on the Pittsburgh & Connellsville Railroad ten miles north of the point where it enters Maryland, northeastward eighteen miles to Bedford, from which a railroad is in operation to Huntington on the Pennsylvania Railroad.

Indiana North & South Railroad.

The contract for the construction of this railroad from Attica, a station on the Toledo, Wabash & Western Railway, 21 miles southwest of Lafayette, southward through Brazil, Bloomfield and Loogootee to Rockport, has been let to Chamberlain & Mathews, of Ohio. Rockport is on the Ohio River about 30 miles east of Evansville.

Kansas Pacific.

The stock shipments over the Kansas Pacific road, from January 1 to October 31, of the present year, amount to 106,165 head, requiring 5,422 cars to move them. During the month of October alone the road has shipped 305,107 head of cattle, employing for the purpose 1,606 cars. During the present year it is thought by the officers of the road that they will have transported 125,000 head.

The location of the manufacturing and repair shops of the Kansas Pacific at Lawrence gives great satisfaction to the people there. They will require the expenditure of large sums of money.

Southern Transcontinental.

The corporators elected by the Legislature of the State of Texas to organize the Southern Transcontinental Railway Company, in accordance with the provisions of the charter granted to them, met yesterday afternoon at the St. Nicholas Hotel and effected a final organization. The original projectors of the road were present in force, together with the President of the old El Paso corporation, Gen. John C. Fremont, and such well-known capitalists as Marshall O. Roberts, Mr. Wm. R. Travers, John Jacob Astor and Henry G. Stebbins, of New York; J. Don Cameron, of Pennsylvania, and R. M. Bishop of Ohio.

The meeting was very large, and the proceedings harmonious and interesting. Gen. Fremont took the chair at about 12 oclock, M., as first of the incorporators under the Texas bill. Col. S. W. Morton, of Kentucky, reported from a committee previously appointed, that the first million of stock had been duly subscribed, and then the board of incorporators adjourned *sine die*. The stockholders then proceeded to ballot for directors of the company, when the following gentlemen were chosen, by a full and unanimous vote:

Marshall O. Roberts, New York; John C. Fremont, New York; E. B. Hart, New York; H. W. Gray, New York; Edward Weston, New York; W. R. Stewart, New York; Ames Van Wart, New York; J. W. Forney, Pennsylvania; J. B. Bowman, Kentucky; Geo. Maney, Tennessee; C. F. Holly, New Mexico; R. M. Bishop, Ohio; J. W. Throckmorton, Texas; B. F. Grafton, Texas; G. H. Giddings, Texas; H. G. Stebbins, New York; W. R. Travers, New York; John J. Astor, New York; Edward Pierrepont, New York; N. P. Banks, Massachusetts; J. Don Cameron, Pennsylvania, Z. F. Smith, Kentucky; W. S. Sherrod, Alabama; M. C. Hunter, Indiana; S. W. Morton, Kentucky; W. M. Harrison, Texas; W. T. Clark, Texas; J. M. Tebbetts, Arkansas; E. W. Rice, Iowa.

After the announcement of the election, Hon. E. B. Hart rose and nominated Gen. John C. Fremont, of New York, as permanent president of the company, which motion was seconded by Hon. John W. Forney, of Pennsylvania, who spoke of Gen. Fremont in most complimentary terms.

Gen. Fremont responded with much feeling, and said that taken wholly by surprise, he could not sufficiently thank his friend, Col. Forney, for the manner he had alluded to him; but while thanking his friends for the compliment they had paid to him, in asking him to preside over the permanent organization of this company, he felt it not only a duty, but a pleasure to ask them to confer the position of permanent President of the Southern Transcontinental Railway Company upon his friend, Marshall O. Roberts; he possessed the confidence of the whole country, especially of the financial world, and judging by his wonderful success in the past he felt that under his auspices this great enterprise is destined to a wonderful success in the future. Gen. Fremont then put the question upon the nomination of Marshall O. Roberts as President of the new company, and he was elected amid great applause.

Mr. Roberts took the chair and pledged himself to stand by the enterprise to the last. One of the dreams of his life had been to bring the North and South together in friendship and in peace, and he believed that the Transcontinental Railroad was one of the surest means to that great end. The directors after the unanimous election of Mr. Roberts, chose with equal unanimity, Col. Henry G. Stebbins, as Vice-President; Wm. R. Travers, as Treasurer; John D. Defrees, as Secretary; and R. M. Corwine, as Attorney. The directors then adjourned until 5 o'clock in the evening, when they adopted their by-laws.—*New York Times, Nov.* 1.

Cincinnati & Springfield Short Line.

Considerable subscriptions to this company have been made the towns along the line and it is believed that enough will be secured to insure its construction.

Ohio & Mississippi.

The difficulties in the way of a joint occupation of a bridge across the Ohio at Louisville, by the Jefferson & Indianapolis, and the Ohio & Mississippi Railroads, have been satisfactorily adjusted, and the additional track for the broad gauge line will be put down immediately. Notwithstanding the enlargement of the canal around the Falls, boats from the lower Ohio and the Mississippi will probably prefer to discharge their freights at Louisville, rather than to ascend the river 150 miles further to Cincinnati, and this will be more specially true during the low stage of water in the latter part of summer and in the autumn, so that it is of the greatest importance that there should be at Louisville the best facilities for forwarding. With the entrance of the Ohio & Mississippi road to Louisville there will be three competing railway lines for Eastern freights—the Jeffersonville, Madison & Indianapolis, the Ohio & Mississippi and the Cincinnati & Louisville short line—the first two are on the Indiana side of the river, and the third is in Kentucky.—*Exchange.*

St. Paul & Chicago.

Trains commenced running on this road between St. Paul and Red Wing on the 1st inst.

Rockford, Rock Island & St. Louis.

W. H. Pettibone, Superintendent of the Rock Island division of the road, with a gang of 38 men, on the 1st inst., laid 6,462 feet of track, below Orion, in the incredibly short time of 5 hours. This is only 148 feet less than 1¼ miles, and, we think, excels anything in the history of track-laying in this country.

To lay the above amount of track required 3,228 ties; 546 rails, weighing 400 pounds each, or a total of 218,400 pounds; 13,104 spikes; 1,092 splice plates; 2,184 bolts. Sum up the amount of muscle necessary to handle that amount of material, drive the spikes, screw the bolts, fit the plates, &c., divide the work among 38 men, and make a five hours' job of it, and you can form an idea of the rapidity with which each man must have worked.

The gap between the two approaching forces is narrowed to ten miles. One week more will close it, and then our great through line to St. Louis will be completed. And for this speedy result we shall be, in no slight degree, indebted to the energy of Mr. Pettibone. —*Rock Island Union.*

Muscatine, Tipton & Anamosa.

This project is being revived. The Muscatine *Journal* says there is a movement on foot in Muscatine and Cedar county to reorganize the company and make a renewed effort for the building of the road.

Austin & Mason City.

The Minneapolis *Tribune* of Oct. 29 says: "What is known among those interested in the Milwaukee road as the 'Austin & Mason City Cut-off' has been completed. The distance between the two points is thirty nine miles, and the new road opens up to Minnesota a direct connection with St. Louis." The road connects at Mason City with the Central Railroad of Iowa, which is in operation as far south as Marshalltown, and will soon be completed through Grinnell, Oskaloosa, Eddyville and Albia, to Moulton, where it will connect with the North Missouri Railroad.

Cincinnati, Lafayette & Chicago.

Ground was broken on this line on the 28th inst. at Sheldon, Ill., a station on the Toledo, Peoria & Warsaw Railway very near the Indiana line. The road is to extend from that point southeast to Lafayette and northwest to Kankakee. In connection with the Illinois Central it will complete an entrance into Chicago for the Indianapolis, Lafayette & Chicago road.

Fremont, Elkhorn & Missouri Valley.

Ten miles of this railroad, from Fremont, the junction of the Union Pacific and the Sioux City & Pacific, northwestward were completed last year. Lately work was resumed on the extension which is to be completed forty miles this year. This is one of Mr. John I. Blair's roads, and he has on it the force which constructed the Iowa Falls & Sioux City road.

Chicago & Southwestern.

The track layers have reached Ashland on the Des Moines river, about 15 miles beyond Fairfield.

RAILROAD GAZETTE

PUBLISHED EVERY SATURDAY.

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Editorial Announcements.

Correspondence.—We cordially invite the co-operation of the Railroad Public in affording us the material for a thorough and worthy Railroad paper. Railroad news, annual reports, notices of appointments, resignations, etc., and information concerning improvements will be gratefully received. We make it our business to inform the public concerning the progress of new lines, and are always glad to receive news of them.

Articles.—We desire articles relating to railroads, and, if acceptable, will pay liberally for them. Articles concerning railroad management, engineering, rolling stock and machinery, by men practically acquainted with these subjects, are especially desired.

Inventions.—Those who wish to make their inventions known to railroad men can have them fully described in the RAILROAD GAZETTE, *if not previously published,* FREE OF CHARGE. *They are inzited to send us drawings or models and specifications. When engravings are necessary the inventor is expected to furnish his own engravings or to pay for them.*

Engineering and Mechanics.—Mr. M. N. Forney, Mechanical Engineer, whose office is at Room 7, No. 72 Broadway, New York, has been engaged as Associate Editor of this journal in charge of these departments. He is also authorized to act as our agent

Change in Rates.—On and after the 1st of January next, the price of subscription will be four dollars per year. Until that time, subscriptions will be received for periods not exceeding one year at the old rate—three dollars per year.

☞ *Our Prospectus and Business Notices will be found on the last page.*

WORK—ITS COMPENSATIONS AND ALLEVIATIONS.

Several thousand years ago it was announced to mankind that "in the sweat of thy face shalt thou eat bread." Although this may not be universally received as a Divine utterance, it is nevertheless recognized as one of the conditions of life and as a social law to which we are subject. Perhaps one of the hardest lessons learned in youth is that experience which teaches the absolute nature of the obligation to work. It cannot be escaped. It comes to us in some form or other in every position of life. Whether we hoe potatoes on a Western prairie, search for diamonds in South Africa, count money in Wall street, or run a level over the Rocky Mountains, wherever we go, we will find that the earth refuses to "yield her increase" without labor. Nor is it our merely physical wants alone which impose the obligation to work. We are so constituted that toil of some kind is necessary for the development and preservation of a sound body and mind, so that it is perhaps fortunate for most of us that we are obliged to work in order to get our daily bread. Perhaps, take it altogether, there is no sort of discipline which has done and is doing so much to develope noble traits in human nature as faithful obedience to this obligation. In the performance of this duty all the heroic virtues are exercised and the baser and selfish feelings subdued. Self-sacrifice becomes a habit, courage and endurance are daily and hourly practiced, and obedience to some sort of law one of the conditions of our lives. Many an humble working man carrying his kettle at sunrise and bearing the burden and heat of the day possesses, often unconsciously, more of the characteristics of heroism than those whom the world has honored with the typographic laurel crowns of the Nineteenth Century. Perhaps the greatest enemies of the human race are the "dead beats"—men too indolent to work and who, in some form or other, must and do live off of the work of their neighbors. Just as each individual is now required to have some visible means of support, so, when once the laws of social science are thoroughly understood, we believe every person will and should be compelled by law to have some visible and useful occupation under penalty of being put to work by the State. The idle and useless man, if able to do anything, should be regarded as an enemy to his kind, and by a social law at least be placed outside of the pale of respectable society. Baconin his characteristic quaint and wise way has said, "Wicked men will ever live like rogues, and not fall to work, but be *lazy* and spend victuals." Another old worthy stated the truth concisely when he bequeathed to the Sunday schools the maxim about the devil finding some mischief still for idle hands to do.

While all this is true, there is another side to the question. That work does much to develope the sterner virtues, we all know who work, and that idleness leads into very disagreeable ways we all see; but if it is therefore assumed that toil developes *all the virtues* it will be a mistake. There are parts of the human character which are cultivated by entirely different means. The emotions of gentleness and tenderness, it is true, can exist in the bosoms of men who have muscles and sinews like an ox and who work all day like a steam hammer. But it is not the work which makes him gentle. *That* comes from some entirely different source. Among our friends we are fortunate in being able number many men who labor daily—some who handle a hammer or file, others who push a jack-plane or who stand by throttle and reverse levers watchful as eagles—and all of them with a fineness of nature not excelled if equaled by highly educated and cultivated gentleman. It was not their work, however, which did this, excepting perhaps in a certain negative way in preventing the growth of evil. Running an engine in a driving snow storm or "switching" cars for a stupid conductor or careless brakeman does not develop grace or gentleness. The latter occupation especially is apt to lead to speech more emphatic than refined. We are not asserting that a man may not run a locomotive and still have at any rate the grace of dignity or the gentleness which comes of patience; what we do say is that the motive for these must be sought in some other source.

We have been led into this train of thought by a recent visit to the Harlem Railroad shops in New York. Not finding Mr. Strong, the Superintendent of Machinery, in his office, we we went into the shop to enquire for him. We were then told he was in the engine house, when we were directed by one of the men to go to the "reading-room." Now if there is any place less suggestive of the idea and comfort of a reading room than a dingy, smoky, greasy engine house, we do not know where it is, and we were astonished not a little to be directed to such a place. However we found the person we sought before we reached what we suspected was either a mythical place, or a satirical name for one of those odd corners so common about railroad repair shops. On inquiring of Mr. Strong he said that "the boys got up a room to spend their spare time in," and by way of comment he added that he liked it, because now when he wanted them he always knew where to find them. He showed us into a room adjoining the engine-house about twenty feet square and furnished with a table, half-a-dozen or more plain wooden armchairs, a lounge, writing-desk, closet for hanging up clothing, wash-stand, looking-glass, water-cooler and clock. The table was supplied with the New York daily papers and the walls hung with pictures of the Baldwin, Rogers and Taunton engines. The whole had an air of comfort, without any other pretence. The railroad company, we were told, fitted up the room and the men paid the expense of the furniture and the subscription to the papers. The use of the room, we believe, is confined to the engineers on the road, although we are not quite sure of this point and neglected to inquire. The door has a spring lock, to which each subscriber has a key, and the room can be used only by them who help to defray its expenses.

The whole arrangement seems so practical and meets a want so much felt that it is a little surprising the idea has not been more generally adopted. It gives the men a comfortable place to spend their unemployed hours which practically takes away the temptation to go to worse places and at the same time furnishes the advantage or opportunity to get the material of what to a certain extent is instructive reading. It supplies an element which their daily occupation does not give. It furnishes the means of making profitable the hours which are usually idle or wasted, and gives food for thought in what would otherwise be vacant moments. A judicious selection of books would furnish the material for gaining much useful information.

Few people without experience—and especially those accustomed to do their work in comfortable offices, carpeted, perhaps, and warmed and well lighted—are unaware of the desolation of an engine-house at midnight. Engineers and firemen often arrive at the end of their "run" somewhere among the small hours of the night, or are obliged to start out late, or from other causes and at other times have several hours to spend about the "round-house." Often the only place where they can be with *any* comfort is in the cabs of their locomotives, toasting themselves alternately on one side and then on another, before a red-hot stove, with the surrounding atmosphere at about the freezing point. We believe that a faithful *verbatim* report of some of the conversations which are held nightly in such places would be a literary curiosity and entirely unique. We also commend the scene to some of our artists. The gloom of the engine-house, the glare of the torches and red-hot stove, the strongly marked faces and muscular forms of the men, and the spectral figures of the huge locomotives standing in a circle like giant ghosts, we think would form a picturesque and vivid scene, which few of our artists could "compose" under the skylights of their quiet studios.

Notwithstanding its picturesqueness it is usually very uncomfortable, and the conversation, we are forced to confess, is not always of the most improving character. Now we do not believe that a reading room would always make scholars of engineers or entirely close the mouths of the profane. But we do believe it would make the men more comfortable than they now are and that newspapers and some show of books would give them something to think and talk about which would be pleasanter to listen to than to hear Tom Brown or Bill Smith perpetually telling what his engine did when "she was coming up the hill." Such descriptions are sometimes graphic, we admit, but not always as accurate as a table of logarithms.

The arrangement by which those only who help to pay the expenses of the reading room are admitted to its privileges is, we think, an essential element in the success of the project. People who do not value the advantages enough to pay part of the expenses are not likely to be desirable society to those who do. A certain amount of decorum is requisite in such a place, and bummers and loafers should be kept out if possible. A small fee will give some degree of exclusiveness to the place and admit only those who feel an interest in the project equal to the amount of money paid.

We feel convinced that, when the men request it, railroad companies would make ten times the cost of fitting up such a room in the more faithful service which would result from it. No man can do his best work either when he is or immediately after he has been very uncomfortable.

We feel disposed to make one suggestion to those disposed to try the experiment of the Harlem road; which is that there should always be two rooms, one for reading and the other for sleeping. We doubt whether most men can read to much advantage with two or three others snoring about him; or sleep well with half a dozen discussing in the same room the merits of 4½ or 5-foot wheels for pulling freight. We also think a little wider range to the literature for the room would be an improvement. If some of the illustrated papers—without indecent pictures—or magazines or books on mechanical or engineering subjects were added it would increase the interest and usefulness of the place.

The Omaha Transfer.

There has been some controversy between the Omaha and the Council Bluffs newspapers concerning the establishment of a Union Freight Depot in Omaha by the three Chicago lines, Omaha papers claiming that a change was to be made greatly in favor of that city, and Council Bluffs journals denying the truth of such statements,—all being in accordance with the practice of those hostile communities, which will never be out of business so long as they can quarrel.

We are informed that the three Chicago companies, in accordance with the policy of harmonious and eco-

nomical operation lately agreed upon, intend to establish in Omaha a union freight depot to which all freight consigned to Omaha will be consigned at their expense, until, at least, the Union Pacific is ready to receive freight on the Iowa side. But the only change in this particular will be that there will be only one Chicago freight house in Omaha, and one freight agent, instead of three as heretofore. Freight is now transferred by each company separately to its own freight house in Omaha, and the change will be for the benefit of the companies by the economy thereby secured, and not a discrimination in favor of either of the rival towns. The transfer across the river will also be made by a single line instead of two as heretofore.

These measures indicate that if the Union Pacific is to make Council Bluffs its eastern terminus, it is not prepared to do so now, and that it will probably wait until its bridge is completed.

The Erie Railway and Niagara Falls.

It was last spring, we believe, that the Erie Railway Company commenced the construction of a line from Buffalo to Niagara Falls. This movement was caused, ostensibly, by certain indications that the Lake Shore & Michigan Southern Railway would discriminate against it and in favor of the New York Central in its eastward business. But there was before sufficient reason for the Erie to seek a connection with Niagara Falls. It has hitherto received but a small portion of the traffic moved eastward by the Michigan Central and Great Western line, two transfers being necessary, one at Niagara Falls and the other at Buffalo, and the connecting link being controlled by a hostile corporation. By the new line passengers and freight from the West can be transferred directly at Suspension Bridge. By this arrangement, doubtless, the Erie will receive a larger share than ever before of the traffic from the Canada and Michigan lines.

Another advantage—by no means a slight one—will be the facilities obtained for passenger business to Niagara Falls. That great wonder of nature attracts as many travelers as a considerable town, and the "Falls business" has been no inconsiderable item in the summer traffic of the New York Central. When the new line is completed the Erie can run its cars through from New York to the Falls on a line a little shorter and much more picturesque than that of the Central. With its elegant equipment the Erie is well prepared to do this business, and it will be strange if it does not obtain a considerable share of it.

But the new line is likely to prove valuable to other parties besides the Erie. If it has heretofore sent business to and from the West by way of the South Shore line, it has not been through any affection for it, but rather because no other line was open to it from Buffalo. The North Shore line can now reap a benefit from a quarrel in which it is not concerned; whenever the conflict rages hotly between Gould and Vanderbilt, the Erie can refuse to feed its enemy by turning its traffic to the Great Western line, not because it loves it, but because it hates Vanderbilt.

The connection with the Great Western will be secured in another and a better way, it is true, when that company's new line and the Buffalo Bridge are completed. But for this the Erie is not willing to wait, and by this it will not gain the desirable connection with Niagara Falls.

The closer relations likely to be established between the Erie and the North Shore line have led some to believe that the harmonious arrangements between the latter and the New York Central may be interrupted. We cannot see why this should be so. The Erie is certainly entitled to all the business which its own agents can obtain and the Great Western cannot refuse to deliver it, and certainly will not wish to. Under any circumstances the New York Central must receive very nearly all its New England business and most of its New York business, and it ought to be content that the Erie does not gain the lion's share of the latter as it might if it had a narrow-gauge track. It has lately put obstacles in the way of the completion of the new branch, but these are probably expected to delay only and not to defeat the connection.

The Great Western Report.

The annual meeting of the Great Western Railway Company of Canada was held in London on the 12th inst. The report of the directors for the last half-year we published last week. The most noticeable features of the business of the half-year are the very large increase in through and local business and the considerable decrease is strictly operating expenses. It is true that there was a considerable decrease in the receipts from through traffic, but that is readily accounted for by the remarkably low rates which prevailed for a large part of the half-year. The increase in local business has brought an increase in receipts also, and the aggregate receipts are larger than ever before.

This most diagreeable feature of the report to the shareholders was the large expense for renewals, and we see by the report of the meeting that some of them objected to it. Had they known the condition of the road last winter and the certainty that the road would lose a very large part of its business if that condition were not improved, they would hardly have questioned the wisdom of these large expenditures.

The arrangement with the Michigan Central seems to have given universal satisfaction, and no one seems to have doubted the advantages of the new method of operating the road introduced by Mr. Muir.

The directors have every reason to congratulate themselves on the result of their visit to America and the arrangements then agreed upon. But for the combination then agreed upon we venture to say that the Great Western of Canada would have had by next spring a rival line across Canada receiving all the through traffic of the Michigan Central. The latter could no longer afford to depend upon a connecting line so inferior and irregular as the Great Western had become. Its rivals on the south had perfected their connections and were operating harmoniously and effectively. They were sure to gain on the Michigan Central every month should the Great Western remain without improvement. Its managers were determined to have a good line for an eastern outlet and were prepared to make one if the Great Western should not be brought into satisfactory condition. If this had been done, we fear the shareholders of the Great Western would hardly have seen a dividend again for many years. Now, on the contrary, the line is in good condition, with heavy traffic, and sure to improve in value. The trying fast trains make their time on that line just about as regularly as on the other sections of the route, and there is every reason to believe that the winter passenger business, which was very irregular last year, will now be conducted as promptly and safely as on the other lines.

Canada and the West India Trade.

In connection with the proposition to join Newfoundland to the Dominion of Canada, urged without success last year, was a scheme for a novel steamer line which would extend across the Atlantic and also along a large part of the eastern coast of North America. There were to be seven steamers of about 2,000 tons each, one to leave Liverpool weekly for St. Johns, Newfoundland, thence to Halifax, where coal would be received, to a United States port to receive the Canada mail for the West Indies, and thence to Bermuda, St. Thomas and Demarara, which last town would be the terminus of the route. The return voyage would be on the same line. It is supposed that such a line would cultivate commerce between Canada and the West Indies, especially the British islands. A line of smaller steamers running between Montreal and Pictou, Nova Scotia, would connect with it at Halifax, through the railroad from Pictou to Halifax, and thus bring the heart of the Dominion within easy reach of the tropics.

Such a line might easily gain custom from the West as well as from Canada. Our connections with Montreal are excellent. Transportation to that city can be afforded very cheap, and if that city should ever import a surplus of tropical products, it may look in this direction for a market.

A great many cities very widely separated now put forth claims for the trade in tropical products. Galveston in the Southwest promises to supply all our western markets with coffee, sugar etc., when its connection with Kansas City is completed and the necessary steamer lines across the Gulf established. Another Texas city still further southwest (altogether on paper at present, we believe) is a candidate for the position. New Orleans, with some show of reason, claims that its position with the Gulf (barring the bar) on one side and the ten or fifteen thousand miles of river navigation on the other, by which its boats can reach Northern Texas, Arkansas, Missouri, Kansas Nebraska, Dakota, Montana, Minnesota, Wisconsin, Illinois, Indiana, Ohio, Pennsylvania, West Virginia, Kentucky, Tennessee, Northern Alabama, Mississippi, and Louisiana, must inevitably make it the great distributing point between the Uunited States on the one hand and the West Indies and South America on the other. Mobile claims a similar position, substituting railroads for rivers. Pensacola is sure that it is the coming city of the Gulf and points to its fine harbor as the instrument which is to secure it the place in connection with a railroad system, not yet existing to be sure, but already begun. On the Atlantic coast, the old cities of Savannah and Charleston and the new ones of Fernandina, Brunswick and Beaufort are confident that the tropics are theirs. Norfolk is ambitious for the same honor. Baltimore not only seeks it but has found not a little of it, having also established a trade in coffees and sugars to points far north and west of it. New York says little but does much and feels secure that its supremacy will not be destroyed by any efforts or advantages of its rivals. Boston hardly hopes to increase its trade in this direction, now considerable. Montreal, probably, must remain content to cater to the Dominion.

Chicago and Baltimore.

Not long ago a correspondent of the Chicago *Tribune* in enumerating the advantages of the new line from Pittsburgh to Chicago which the Baltimore & Ohio Railroad Company proposes to build made a comparison of distances by this and other routes in which very serious misstatements were made. The distance from Chicago to New York is given as 982 miles, and to Baltimore by the new route only 709 miles. As the distance from Baltimore to New York is only 190 miles, this would make the route from Chicago to New York *via* Baltimore 83 miles the shortest.

The error is in the statement of the length of the Pittsburgh & Connellsville Railroad, from Pittsburgh to Cumberland. This is given as only 80 miles, when in fact it is 148. The estimated distances on the line between Pittsburgh and Chicago are pretty fairly given, though with too little allowance for curves. The total length of that line is given as 431 miles, which is 37 miles shorter than the Fort Wayne line. Taking this estimate of the distance to Pittsburgh, the whole length of the Baltimore & Ohio line from Chicago to Baltimore will be 757 miles—which is just 33 miles shorter than the line now open, all the parts of which are controlled by the Pennsylvania Railroad Company. From Pittsburgh to Baltimore the Pennsylvania route is only six miles longer than the Baltimore & Ohio route.

But another mistake is made in the comparison by taking the longest instead of shortest route between Chicago and New York. There is one 982 miles long, it is true, but there are others 899, 911, 960 and 962 miles long respectively.

We call attention to this because we have found similar misapprenehsions to exist elsewhere, and the comparisons are, of course, valueless, when made so inaccurately.

Examination of Engineers.

The authorities of the county of Westmeath, Ireland, advertise in the London technical papers for a county surveyor. The selection, it seems, is not to be made by favor, nor is the office to go to the lowest bidder, but the following is the method of selection. We copy from the advertisement:

An OPEN COMPETITION for the COUNTY SURVEYORSHIP of WESTMEATH, with a maximum salary of £400, will be held in DUBLIN in NOVEMBER next.

The examination will extend over the four or five days commencing with November 8th, and the five days commencing with November 22d, and will be in the following branches of knowledge:

PART I.	Maximum of Marks.
Mathematics, including Geometry, Trigonometry, Algebra, Differential and Integral Calculus and Geometrical Optics,	100
Mechanical Philosophy, including Statics and Dynamics, Hydrostatics and Hydraulics, Pneumatics, and Heat regarded as a source of power,	100
Experimental Science, including Inorganic Chemistry, Heat, Electricity, and Magnetism,	100
Geology and Mineralogy	40

No candidate will be eligible who does not show some proficiency under one at least of the heads included in Part I.

PART II.	Maximum of Marks.
Strength and other properties of Materials, and the Calculation of Strains,	100
(*A.*) Railway and Canal Engineering	140
(*B.*) Marine Engineering, including Harbour, Dock, Sea, and Reclamation Works,	140
(*C.*) Hydraulic Engineering, including Water Supply, Sewage, and Irrigation,	140
(*D.*) County Works, including Architecture, Roads, Drainage and River Works,	140
	1,000

*** Each of the groups lettered *A*, *B*, *C*, *D*, to include designs, estimates, specifications, and the mechanical contrivances connected with it; and candidates will be required to show that they have been engaged in the practice of their profession on adequate works for a sufficient time, or have had in some other way satisfactory opportunities of becoming acquainted with the practice of their profession in some one of the branches thus indicated.

Persons wishing to compete should forward, not later than October 31st, evidence of their age (which must be between 26 and 40) and professional training, to "The Secretary, Civil Service Commission, Common Row, London, S. W."

Such further inquiries as may be necessary will be made by the Civil Service Commissioners with regard to the age of candidates, and also as to their health and character.

This may be taken as an example of method by which it is proposed to supply the civil service of this country with capable men, and which some have recommended for adoption by railroad companies. A certain

amount of professional training being assured by the preliminary examination which must be passed successfully before entrance into the service can be secured, promotion would be made only when further examination and faithful service had demonstrated the candidate's fitness for a higher position.

ELECTIONS AND APPOINTMENTS.

—At a meeting of the Board of Directors of the Memphis & Charleston Railroad Company, held in Memphis on the 26th ult., the following officers were re-elected: Moses J. Wicks, President; George Robertson, Treasurer of Western Division; S. R. Cruse, Treasurer of Eastern Division; C. L. Anderson, Superintendent of Western Division; Chas. S. Williams, Superintendent of Eastern Division; Henry Ryan, Assistant Superintendent.

—Capt. T. W. Bedford has been appointed Chief Engineer of the Brownville & Fort Kearney Railroad.

—At a meeting of the stockholders of the Wilmington, Charlotte & Rutherford Railroad Company, held at Wilmington, North Carolina, on the 24th ult., the number of directors was decreased from 13 to 9, since the State had ceased to be a stockholder, the Legislature having repealed the appropriation made to the road. The following directors were elected: Silas N. Martin, H. M. Houston, T. P. Wells, Edward Kidder, W. H. Michael, F. W. Kerchner, J. L. Brown and Thos. S. Ashe.

The following officers were subsequently chosen: Mr. Silas N. Martin, President, and Col. S. L. Fremont, General Superintendent.

Dr. Sloan, the late President, submitted a written protest from the State against the ignoring of the directors appointed by the State, and the seven "ignored" directors met and elected the following officers: Wm. Sloan, President; B. S. Guion, Chief Engineer and Superintendent; Calvin J. Cowles, Secretary and Treasurer; I. T. Alderman, Assistant Treasurer, Eastern Division; V. A. McBee, Assistant Treasurer, Western Division; R. C. Badger, Attorney. All other officers at present occupying positions are retained.

—Mr. W. H. Patriarche has resigned the General Superintendency of the South Pacific Railroad Company, and Mr. Edwin F. Perkins, once Master Mechanic of the Vermont Central and lately Master Mechanic of the Central Pacific, has been appointed in his stead. Mr. Patriarche assumes the position of General Freight and Purchasing Agent.

—Mr. John Hewitt has been appointed Master Mechanic of the South Pacific Railroad Company.

—The following changes among the general officers of the Ohio & Mississippi Railroad Company have been made by the newly elected officers: M. M. Martin, Assistant Superintendent; Wm. Brownlee, Division Superintendent; positions formerly occupied by E. G. Bondurant and J. K. Pierson.

—At the recent annual meeting of the Central Branch Union Pacific Railroad the following directors were elected unanimously: Samuel C. Pomeroy, Benjamin F. Stringfellow, Wm. F. Downs, Wm. C. Wetmore, Jno. A. Stewart, Henry Day, Clement S. Parsons, Effingham H. Nichols, Alfred S. Barnes, O. H. Palmer, E. B. Phillips, Ralph M. Pomeroy, George S. Hale.

TRAFFIC AND EARNINGS.

—On the 29th ult. the following shipments of Texas cattle were made from Kansas City: the Hannibal & St. Joseph Railroad shipped 44 car loads of Texas cattle; Missouri Pacific Railroad, 30 car loads; the North Missouri ships 63 car loads, including 3 car loads of Cherokee calves. One hundred and fifty car loads were kept back for the lack of cars.

—The earnings of the Great Western Railway of Canada for the week ending October 7, 1870, were:

Passengers	$49,206 88
Freight and Live Stock	46,229 30
Mails and Sundries	2,686 98
Total receipts for week	$98,123 16
Corresponding week, 1869	77,128 18
Increase (28 per cent.)	$20,994 98

—A statement in detail of the comparative earnings of the Cincinnati, Sandusky & Cleveland Railroad for the three months of July, August and September, give the net earnings for 1869 at $126,893.58 and for 1870 at $106,680.34; decrease in 1870, $20,213.24.

—A reduction of 25 cents per hundred on fourth class, and 20 cents per hundred on third class freight between St. Louis and Colorado took effect last Monday. The rates now are from St. Louis to Kit Carson and Denver City, Colorado: First class, $3; third class, $2; fourth class, $1.55 per 100 lbs.

—Horse cars commenced running in Kansas City on the 1st inst.

PERSONAL.

—Mr. A. B. Pullman has sent the following letter of acknowledgement to the committee of Kansas Pacific excursionists who presented him with an elegant set of sleeve-buttons on the part of the party:

"Your very kind note, and the accompanying sleeve-buttons, were received this morning, and I have no words appropriate to express the pleasure I experience in being the recipient of so handsome an expression of your appreciation of the small services I am able to render you. I did not need nor expect it, my own compensation being complete with the assurances I had from time to time on our journey, from one and all, and which your generous courtesy made doubly agreeable. I thank you for these tokens of your good-will, and trust they will form a link to pleasant memories for many a year."

LOCOMOTIVE STATISTICS.

Burlington & Missouri River.

Mr. George Chalender, Master Mechanic of the company, makes the following report for the month of September, 1870:

Miles run by passenger trains	38,722
" " freight trains	67,240
" " miscellaneous trains	37,550
Total number of miles run	143,512

The average cost per mile run was:

For repairs	4.34 cts.
For oil, waste and tallow	.89 "
For fuel	7.99 "
For engineers, firemen and wipers	6.97 "
Total cost per mile run	20.19 "

The average number of miles run was:

To one ton of coal	42.94
" " pint of oil	14.69

Coal is charged at $3.50 per ton. Forty-seven locomotives made mileage during the month, and two were in the shop during the month. All of the locomotives, except two, are coal-burners.

Toledo, Peoria & Warsaw.

The following is the report of the general average of performance of locomotives on the Toledo, Peoria & Warsaw Railway for the month of September, 1870, as made by A. H. de Clercq, Master Mechanic:

Cost per mile for engineers, firemen and wipers	6.91 cts.
Cost per mile for repairs of engine	7.30 "
Cost per mile for oil, waste, tallow and rags	1.31 "
Cost per mile for fuel	6.34 "
Total cost per mile run	21.86 cts.
Miles run to pint of oil	18.42
Miles run to ton of coal	48.15

Total number of engines 45, eleven of which made no mileage. Coal is charged at $2.75 per ton, wood at $4 per cord. The above includes oil used in head-lights, oil used in engineers' lamps, superintendence, and all other expenses appertaining to the department.

MISCELLANEOUS.

—The aspect of affairs in connection with French railway property grows more and more gloomy. It is now roughly estimated that the Northern of France has sustained by reason of the war injuries to the aggregate amount of £1,000,000 sterling; the estimate is necessarily vague, but it seems only too probable that it is correct. The Eastern of France has suffered still more considerably. The sacrifices of the Orleans, and the Paris, Lyons & Mediterranean appear to be only just commencing.

—The Secretary of the Treasury decides that when a railroad company files a map of the line of the route duly certified to as the actual survey line, there is no power to cause it to change said route because it may interfere with another grant of equal date. If the road, however, is not laid out on the most favorable route between the termini as ordered by the act, it may then become subject to official investigation. If, when the grants are each of the same date, and the limits conflict, the grantees will be made equal partners, and will take the same jointly and without reference as to which road may have first filed the map of the definite location; and further, that when application is made by a railroad company for land for a station, sidings, &c., as may be allowed by the grant, the company should file a map showing the section of the subdivision, with the position of the buildings, supported by an affidavit of their existence, and also as to the area required.

—The Union Pacific Railroad Company has under consideration plans for the irrigation of its immense land grant along the Platte, Lodge Pole, Crow Creek, and Laramie Rivers. It is said that hundreds of thousands of acres of land can be reclaimed and made good agricultural land if this is done.

—The Cincinnati Chamber of Commerce has made an appropriation toward defraying the expenses of the suit for an injunction to prevent the construction of the Cincinnati & Newport Railroad Bridge according to the present plan.

REGISTER OF EARNINGS.

FOR THE THIRD WEEK IN OCTOBER.

Milwaukee & St. Paul (825 miles), 1869	$218,184
" " (936 miles), 1870	197,692
Decrease (9½ per cent.)	$20,492
Pacific of Missouri (355 miles), 1869	$82,310 75
" " (355 miles), 1870	77,867 61
Decrease (5½ per cent.)	$4,443 14
Des Moines Valley (344 miles), 1870	$23,099 36
" " (162 miles), 1869	18,027 66
Increase (28 per cent.)	$5,071 70

FOR THE MONTH OF OCTOBER.

Chicago & Alton (431 miles), 1869	$488,658 24
" (465 miles), 1870	468,212 51
Decrease (4½ per cent.)	$20,445 73

Prospects of the Union Pacific.

The Union Pacific Railroad is 1,032 miles long, and cost—at least is indebted to the amount of—$100,000 a mile, as follows, viz:

First mortgage bonds, 6 per cent. gold	$27,237,000
United States mortgage bonds, 6 per cent. currency	27,237,000
Land grant bonds, 7 per cent. currency	9,856,000
Income bonds, 10 per cent. currency	10,000,000
Capital stock	36,715,000
Total	$111,074,000

The annual interest on this enormous indebtedness, exclusive of the stock and the government mortgage bonds, amounts to about five millions, currency, and as 60 per centum of the gross earnings of a railroad is the average required for operating expenses, it follows that this road must earn $12,000,000 a year to keep out of bankruptcy at all. They pay no interest on the government bonds, except in the way of government transportation, and this, charged entire, instead of being half paid for in cash, as per the charter, meets about one-fourth of it. Of course the stockholders expect no dividends in this state of things.

During the last fiscal year, the gross earnings of the road were $8,405,889.24, the operating expense amounting to 67 per centum of it, including, perhaps, $800,000 expended in snow-sheds, fences, etc., not properly belonging to the operating account. There is little doubt that, with good management, it might be made to pay the interest on its bonded indebtedness; the earnings for the last three months show an encouraging increase; and with a line of China propellers of the company's own, which there is a strong probability of their being able before long, it might the succeeding year, to pay something on the stock.

The local business amounts to little as yet, but it is increasing steadily. Nebraska is fast settling up, and Schuyler, a station 75 miles out from Omaha, is becoming important as a point for shipping stock, some 10,000 head having been shipped there from Texas the past season.—*Correspondence Chicago Tribune.*

New Trans-Atlantic Steamship Line.

In a few weeks at the latest, the vessels of the new steam line known by the official title of the "Oceanic Steam Navigation Company," will begin their regular trips between this port and Liverpool. The steamers composing this line will be the largest steam merchantmen afloat, their length being 440 feet and their register 4,000 tons. They are six in number, and are named as follows: Oceanic, Atlantic, Pacific, Arctic, Baltic and Adriatic. The first to cross the Ocean will be the Oceanic, which will be due early in December, and the others are to follow in quick succession.

The establishment of this line has been under contemplation for several years, and the vessels composing it will combine all the qualities requisite for speed, comfort and safety. They will have four masts heavily sparred, which will enable them to carry a considerable spread of canvas, and, in the event of accidents to their machinery, to make a port in good sailing time. Their interior arrangements are peculiar and, in some respects, thoroughly admirable. For example, the saloon, instead of being placed in the after part of the vessel where the motion is always most noticeable, is placed amidships, occupying the entire width of the main deck, and measuring 80x40 feet. The berths and state-rooms occupy the space usually devoted to the saloon, and it is said no steamers crossing the Atlantic will have better or more comfortable accommodation for passengers. The managers of the line are Messrs. Ismay, Imrie & Co., of London and Liverpool, and we are assured that liberal arrangements are making to secure the full and complete success of the enterprise. —*Iron Age.*

Self-acting Signals.

The following description is given of an apparatus invented by Mr. B. Wade, Copley, England:

A wire is extended along the line of rails for any suitable or required distance on each side of the station or crossing, and each extreme end is attached by a rod to a lever, hinged by the side of one of the line rails, which is so formed that the flanges of the wheels of a train or carriage on arrival, and when coming into contact therewith, will actuate so as to turn the signal on, and when departing will turn it off. But as the temperature of the air is constantly varying, a constant natural expansion and contraction of the wire takes place, which would render this apparatus irregular or uncertain in its action, to avoid which the inventor connects each of the wires respectively at their intermediate ends to a movable frame, and these frames he connects by a chain attached at one end to one frame, thence passing around a series of pulleys alternately from one frame to the other, after the manner of blocks, and thence over another pulley at the top of a pillar or post, with a weight attached to the end thereof.

Commission on Purchases.

We hear much complaint of a certain kind of sharp practice on the part of those who hold positions either of public or private trust, and of which municipalities and large manufacturing companies are the principal victims. We refer to the practice of agents, or superintendents, whose duty it is to purchase supplies of any kind for the consumption of parties by whom they are employed, of exacting a commission from the seller, for their own personal emolument, and as a condition of their patronage.

This practice, we are informed, is every day becoming more prevalent, and is rapidly assuming the proportions of a huge swindle, perpetrated against those parties who intrust the details of their business to agents who are more intent in making good bargains for themselves than for their principals. These agents often grow rich much faster than the concerns which they represent, or than would be supposed possible from the salaries which they receive. In cases where they have the dispensation of a large corporate patronage, they are frequently able to retire on an ample fortune after a few years' service.

The influence of this class of middle men is also demoralizing to those with whom they have business dealings, since it has come to be well understood among merchants that they cannot sell their goods to certain large consumers unless they are willing to "come down handsomely" in the way of subsidizing the person who has, *ex officio*, the choice or selection of these goods. Some merchants, who deal upon their honor and are not willing to take an unfair advantage of their customers by overcharging them for the benefit of a third party, naturally object to the payment of this secret commission.

But in that case, they must expect to be passed by, and the contract will be given to parties who are less scrupulous on the score of fair and open-handed dealing. There are always sellers enough who are ready to enter into this illegitimate and corrupt competition for the sake of securing the custom of a large corpotion, and who will not hesitate to substitute inferior goods, in order to leave a margin wide enough to cover their own profit, besides a liberal bonus to the agent of the purchaser.

In this way, the latter often pays the highest prices for the poorest articles, without ever detecting, or even suspecting the fraud. For *fraud* is the only name for such transactions, however ingeniously they may be covered up by false pretences of personal friendship and liberality on the part of those who are ready to offer or accept bribes. The purchasing agent is paid a salary for looking after the interest of his employers; and as the secret commission, which he nominally exacts from the seller is always charged to and ultimately paid by those employers, he is actually guilty of robbing them to that extent.

That such transactions are without the pale of honesty, is evident from the fact that they are always privately arranged, and seldom undertaken except by the employes of large companies, who are accustomed to leave such matters wholly to the direction of their agents, and seldom scrutinize the conduct of the latter. It would be well, hereafter, for railroad and manufacturing corporations to exercise a little closer surveillance over their buying, as well as their selling agents.

Commission and brokerage are well enough in their place, and often valuable agencies in all branches of business. But there are cases in which these agencies are very much out of place—and this is one in point. When they degenerate into bribery and corruption—such as is often witnessed on a large scale in the placing of contracts by municipal and other government agents—they become a nuisance, an enemy to public morals and commercial integrity. If a purchaser wishes to employ a broker to negotiate for him, he prefers to do it openly and for the sake of some special advantage for which he is willing to pay a commission.

But it is hardly a fair thing for him to be obliged to pay a commission and to make a bad bargain at the same time. We are not in favor of any encouragement to that pestilent class of go-betweens and speculators who make it their business to find out the wants of everybody and volunteer to supply them cheaper than any one else, at the same time they are scheming to fill their own pockets at the expense of both buyer and seller.—*Boston Commercial Bulletin.*

The Utility of Railroads for War Purposes.

The importance of railways for strategical purposes has never yet been so clearly demonstrated as in the war between Germany and France, and it certainly could not have been carried on without them to anything like the the same extent or with equal rapidity of action. In modern wars the possession of a railway is of much greater consequence than that of a navigable river or a highway on land, and as on the Continent, with the exception of Russia, they are all laid down on the same gauge (4ft. 8½in.), they can be used alike by the locomotives and rolling stock of friend and foe. If we consider for a moment that there are at the present time more than a million of Germans under arms, of whom, after deducting the great losses in the battles already fought, at least 600,000 have advanced into the heart of France, some of whom are at this moment under the walls of Paris—if we consider further that it is not only in the enemy's country, where the inhabitants are naturally hostile, and by no means inclined to furnish food and supplies, but that it has till lately been occupied by large bodies of French soldiers, who have not failed to exhaust the resources of those districts—it becomes clear that provisions, forage, ammunition, and reinforcements—everything required, in short, for the success of the undertaking and the sustenance of the armies—must be sent up every day from the depots in the rear to wherever the front may be, and that the further they advance the greater the difficulty must become.

In the present instance the difficulty has been much augmented by political and geographical obstacles. Owing to the interposition of the neutral territories of Belgium and Luxemburg in the north and Switzerland in the south the only spot where the two belligerent frontiers touch is the Palatine or Rhenish Bavaria; and therefore there is but one line of railway available—viz.: that from Mannheim to Forbach and Metz, for the southern line through Strasbourg has been rendered impassable by blowing up the railway bridge between that fortress and Kehl, on the German side of the Rhine. But this route has the disadvantage of passing under the guns of the great fortress of Metz—indeed, it goes through a part of the outworks of the fortification—and thus there is necessarily a break of continuity. The Prussians have, however, shown that their engineers are fully equal to the emergency of the occasion, for within a fortnight they have not only surveyed the country, but actually laid down a railway of twenty five miles in length from the station of Remilly (to the south of Metz) to Pont-a-Mousson, including a temporary but safe railway bridge over the Moselle, by which not only is Metz altogether avoided, but a saving is effected of nearly twenty miles in distance. This wonderful exploit—for it is a feat unparalleled in the history of railway engineering—was achieved by the Prussian Royal Field Railway Corps, a separate organization formed with admirable forethought in time of peace, and attached as a branch of the Royal Pioneer Battalion. The sleepers and rails were supplied partly by the Rhenish Railway Company; whilst fatigue parties of infantry soldiers and pioneers, assisted by a party of colliers from the coal mines at Saarbrucken, were put in requisition for the earthwork of the cuttings and embankments.

"All stratagems are fair in war, but the Germans have discovered to their cost that some of those put in operation by the French cause them a deal of trouble and loss of valuable time. For instance, the French had on more than one occasion to retreat so suddenly, and, we may add, so unexpectedly, that there was no time to destroy the railways, fill up the tunnels, or undermine the bridges. It was, however, found that in several places where they were obliged to retreat suddenly and abandon their railways they had cunningly taken out the screws, but without removing the rails, which, to a casual observer, appeared to remain intact and be available for immediate traffic. Fortunately the discovery was made in time to prevent any accident, but the consequences might have been most disastrous, not only as connected with loss of life, but by blocking up the road and causing delays when time was so precious. Orders have now been given to exercise the greatest vigilance and caution, and the Field Railway Corps now carefully examine every single rail of the permanent way, and report it perfectly safe for traffic, before any train is allowed to pass over the line. *Experientia docet.*

Two uninterrupted streams of traffic continue to flow on this line night and day in opposite directions—the one bringing fresh troops, ammunition, fodder and proyisions from all parts of Germany, and converging upon Mannheim—and the other carrying back to Germany the wounded of both belligerents, thousands of prisoners, and the empty carriages and trucks, as well as the captured artillery, mitrailleuses, and other trophies of war.

The difficulties of working the traffic on a railway in an enemy's country are much enhanced by two elements that have to be taken into consideration. The drivers, engineers, pointsmen, station-masters, signal workers, and the other employes necessary for working the railway have had to be brought from Germany, and at first were of course utterly ignorant of the locality, the system of shunting and signaling, and the other minutiæ of detail in the working of the railway. They are all in the temporary employ of the Federal Government, and have been furnished most willingly by draughts from almost every railway in Germany; but having all worked under different systems, it required strong efforts and energetic and experienced managers to organize them into one body, and make them work well together. The other difficulty is that in most parts of the line there is but a single pair of rails laid down and when one considers the enormous traffic that passes over them day and night, and the difficulty of arranging the departures of the two streams of trains so as to prevent collisions, it is really no wonder should there be delays, or even occasional accidents, though we must add that of the latter there have been hitherto none worth mentioning.

This war traffic, great as it is, has now been augmented to a still further extent by the order to bring up the heavy siege guns and mortars required for the regular besieging of Strasburg and Metz, which are so strongly fortified that they could only be reduced methodically. This battering train, with its accompaniments of ammunition, shot, and shells, was sent, from Magdeburg, Spandau, and other distant fortresses, and required the service of no less than a thousand special railway trains of thirty carriages each to forward them to their respective destinations.

And, finally, a further strain has now just been placed on the capabilities of the railway and the energies of the employes by having to convey the wounded and unwounded prisoners of MacMahon's army, consisting of nearly 100,000 men, to Germany, together with the captured 400 field guns, 70 mitrailleuses, 150 siege guns found in the fortress of Sedan, and all the Chassepots and other small arms of the prisoners, as well as many of the stores and other trophies of war taken from the enemy. These can only be sent by one line of railway as far as Mannheim; but on the other side of the Rhine this traffic is divided amongst the several lines according to the destination of the prisoners of war in the fortresses of Northern and Southern Germany. For this service six hundred trains are now required, and we are informed that that they have worked and continue to work with an amount of punctuality and freedom from accident which would compare favorably with traffic carried on during a time of peace. —*London Railway News.*

September Earnings of Canada Railroads.

The following table of earnings of the railroads of Canada we take from the *Canadian Monetary Times:*

RAILWAYS.	Passengers	Mails and Sundries.	Freight	Total 1870.	Total 1869.	Miles 1870.	Miles 1869.
Great Western	$147,698	$9,675	$186,164	$342,475	$342,625	351½	351½
Grand Trunk	362,815	34,000	251,018	677,833	635,896	1,377	1,377
London & Port Stanley	2,272	105	2,006	4,383	6,859	94½	94½
Welland*	1,990	731	6,928	9,649	13,164	25	25
Northern†	9,946	706	35,685	46,386	41,427	97	97
Midland of Canada	4,077	269	30,894	35,240	32,236	96	96
Brockville & Ottawa	6,720	460	13,768	20,948	22,277	66	.....
Canada Central	1,732	100	393	2,155	.....	26	.....
St. Lawrence & Ottawa	7,565	747	5,277	13,589	9,560	64	64
European & North American	9,895	819	10,078	20,215	17,195	108	108
Nova Scotia	13,507	963	15,698	30,168	30,990	145	145
Total.....	$446,605	$58,578	$552,599	$1,138,431	$1,144,681	2,353	2,384

* No returns.
† For three weeks.

Discipline Among Railroad Employes.

When rules and regulations have been made for the safe operation of a railway, it would seem that it is the duty of employes to follow rigidly those rules. Self-preservation and the safety of hundreds of thousands of travelers all depend upon a strict following of the directions of the time tables by conductors and locomotive engineers. Are these directions always strictly followed? We fear not. We have a recent proof of the disasters which may happen by a laxity in this respect, a case in which human life was sacrificed and property destroyed. And it is to be feared that other cases may be found where rules and regulations made for the safety of all, employes and passengers alike, are daily trifled with. A correspondent sends us two instances where, as he alleges, the rules of the road were broken by a conductor of a passenger train. Our correspondent may be right in his facts, but there is a chance that he is wrong, and we prefer not to run the chance of doing wrong to the management of the road or the conduct of its employes by printing this statement until we are more fully informed as to the circumstance of the case. Where a road is worked by the aid of the telegraph orders may be sent to the conductors that passengers know nothing about, and where exceptional cases of this kind occur conductors ought not to object to informing inquiring passengers of the facts, so as to relieve the minds of those who feel that they are running unnecessary hazards. The object of our correspondent will be as well reached by our calling the attention of superintendents to the general subject without the specific details to which he alludes. Where disasters do happen from any laxity of discipline and neglect of the rules of operation made by the managers for the safety of all concerned, and these facts are susceptible of proof, the courts will be likely to hold the offending parties to a pretty rigid account. Railway managers are pretty much like other people holding positions of great trust and have the same desire and ambition to protect their reputation before the public as careful managers and to retain the confidence of the stockholders. The pecuniary results of disasters are constantly before the attention of managers and stockholders, and offending parties are held to a pretty strict rule in consequence. Where a mistake is made, and the best and wisest do make mistakes at times, there is every human incentive to prevent the mistake from being repeated. Managers are not omnipresent and their eyes cannot see everything that occurs over their entire lines; but any serious and repeated infraction of rules ought not to occur without their being informed of it, and they are grateful for any information upon these matters and as much interested in keeping up the safe discipline of the road as the most nervous and accident-fearing traveller. Where any one is certain that an employe is breaking a regulation of the road, it is his duty at once to inform the manager or chief officer of the road. That done, the evil is at once stopped; or if not, and disaster follows in consequence, his evidence before a jury will prove of vast benefit. Recent occurrences have drawn the public attention to these matters very strongly and railway managers have the greatest interest in seeing that no infraction of the rules and regulations of the road pertaining to the safety of the traveling public be allowed. —*American Railway Times.*

—It is reported that the people along the line of the Union Pacific Railroad, in order to get satisfaction for the enormous charges for freight and passengers, are taxing that corporation proportionately, and will, probably, collect from them about one hundred thousand dollars taxes in Wyoming Territory this year.

A CERTAIN Judge, while attending court in a shire town, was passing along a road when a boy was just letting down the bars to drive some cattle in. His father stood in the door of his house, on the opposite side of the road, and seeing what his hopeful was doing, shouted out: "John, don't you drive them cattle in there; I told you to put them in the pasture behind the house." The boy took no notice whatever of the remonstrance, and his father repeated the order in a louder tone without the least effect, and the third time gave positive orders not to drive the cattle in there. The son didn't deign to look up, and disobeyed the parental injunction with a coolness which positively shocked the Judge, who, looking at the culprit, said, in a tone of official dignity: "Boy, don't you hear your father speaking to you?" "Oh, y-a-a-s," replied the boy, looking at the Judge, "but I don't mind what he says. Mother don't neither, and 'tween she and I we've about got the dog so he don't."

AN Eastern banker, whose name is very familiar to the public, in early life resolved to take the Patriarch Jacob's pledge, "Of all thou shalt give me, I will surely give the tenth unto Thee." He directed his clerk to open an account with O. P. J. (Old Patriarch Jacob), and to credit it one-tenth of all the commissions that came into the office. For years this banker has been one of the largest operators in the country, and the thousands placed to the credit of O. P. J. have been faithfully applied to benevolent and charitable objects.

THE deepest excavation in the United States is a copper mine near Lake Superior. It is thirteen hundred feet deep.

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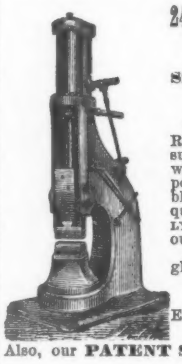

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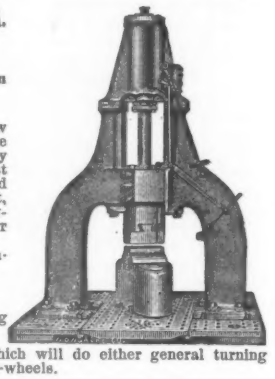

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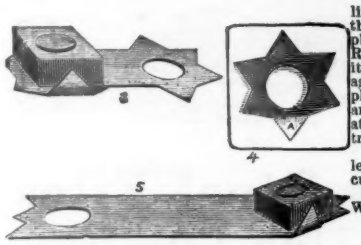

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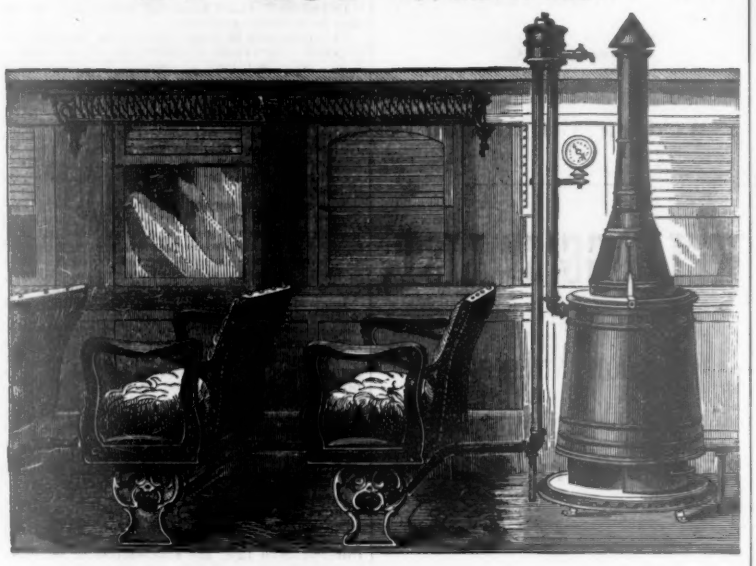

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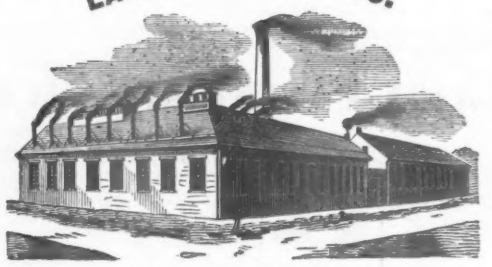

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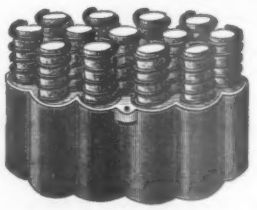

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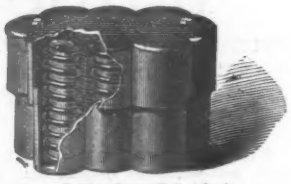

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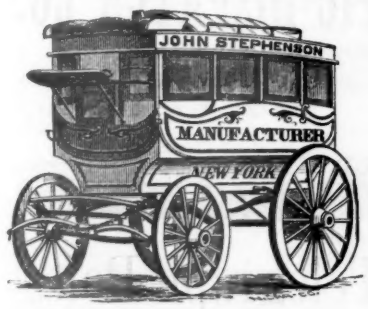

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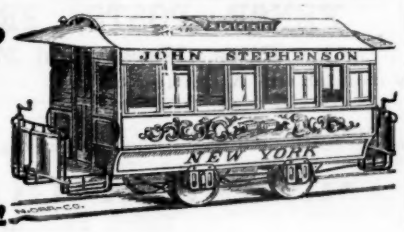

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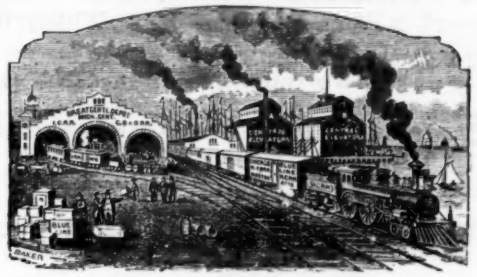

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Great California Line.

TRAINS LEAVE WELLS STREET DEPOT AS FOLLOWS:

8:15 A. M. Cedar Rapids Pass | **9:15 P. M. Night Mail.**
10:30 A. M. Pacific Express. | **9:15 P. M. Rock Island Pass.**
10:30 A. M. Rock Island Exp. | **4:00 P. M. Dixon Passenger.**

For Sterling, Rock Island, Fulton, Clinton, Cedar Rapids, Boone, Denison, Missouri Valley Junction, Sioux City, Council Bluffs and Omaha, there connecting with the

UNION PACIFIC R. R.

For Cheyenne, Denver, Ogden, Salt Lake, the White Pine Silver Mines, Sacramento, San Francisco, and all parts of Nebraska, Colorado, New Mexico Arizona, Wyoming, Montana, Idaho, Utah, Nevada, and the PACIFIC COAST.

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
To OMAHA,.....	23	$20.00	To SACRAMENTO,.	4½	$118.00
" DENVER,.....	52	70.75	" SAN FRANCISCO,	5	118.00

TRAINS ARRIVE:—Night Mail, 7.00 a. m.; Dixon Passenger, 11.10 a. m.; Pacific Express, 3:50 p. m.; Rock Island Express, 3:50 p. m.; Cedar Rapids Passenger, 6:50 p. m.

FREEPORT LINE.

9.00 A. M. & 9.45 P. M. For Belvidere, Rockford, Freeport, Galena, Dunleith, and St. Paul.

4.00 P. M., Rockford Accommodation.
5.30 P. M., Geneva and Elgin Accommodation
6.10 P. M., Lombard Accommodation.
5:50 P. M., Junction Passenger.

TRAINS ARRIVE:—Freeport Passenger, 2:30 a. m., 3:00 p. m.; Rockford Accommodation, 11:10 a. m.; Geneva and Elgin Accommodation, 8:45 a. m.; Junction Passenger, 8:10 a. m.; Lombard Accommodation, 6:50 a. m.

WISCONSIN DIVISION.

☞ Trains leave Depot, cor. West Water and Kinzie Sts., daily, Sundays excepted, as follows:

10.00 A. M. DAY EXPRESS, for Janesville, Monroe, Whitewater, Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Neenah, Appleton, and Green Bay.

3.00 P. M., Janesville Accommodation.

5.00 P. M. NIGHT EXPRESS, for Madison, Prairie du Chien, Watertown, Minnesota Junction, Portage City, Sparta, La Crosse, St. Paul, and ALL POINTS ON THE UPPER MISSISSIPPI RIVER; Ripon, Berlin, Fond du Lac, Oshkosh, Menasha, Appleton, Green Bay, and THE LAKE SUPERIOR COUNTRY.

5.30 P. M., Woodstock Accommodation.
6:20 P. M., Barrington Passenger.

TRAINS ARRIVE:—5:30 a. m., 7:45 a. m., 11:10 a. m., 1:00 p. m. and 7:15 p. m.

MILWAUKEE DIVISION.

MILWAUKEE MAIL,	8:00 A. M.
EXPRESS, (ex. Sun.) Waukegan, Kenosha, Racine and Milwaukee,	9:45 A. M.
EVANSTON PASSENGER,	11:40 A. M.
HIGHLAND PARK PASSENGER,	1:15 P. M.
MILWAUKEE ACCOMMODATION, with Sleeping Car attached	11:00 P. M.
EVANSTON ACCOMMODATION, (Daily,) from Wisconsin Div. Depot	1:30 P. M.
KENOSHA ACCOMMODATION, (Sundays excepted) from Wells St. Depot	4:15 P. M.
AFTERNOON PASSENGER, from Milwaukee Div. Depot	5:00 P. M.
WAUKEGAN ACCOMMODATION, (except Sundays) from Wells St. Depot	5:25 P. M.
WAUKEGAN PASSENGER, (Sundays excepted) from Wells St. Depot	6:15 P. M.
	5:00 P. M.

TRAINS ARRIVE:—Night Accommodation, with Sleeping Car, 5:00 a. m.; Day Express, 4:10 p. m. Milwaukee Mail, 10:10 a. m.; Afternoon Passenger, 8:00 p. m.; Waukegan Accommodation, 8:25 a. m.; Kenosha Accommodation, 9:10 a.m.; Evanston Accommodations, 1.40 and 4.00 p. m.; Waukegan Passenger, 7:55 a. m.; Highland Park Passenger, 3.45 p. m.

PULLMAN PALACE CARS ON ALL NIGHT TRAINS.

THROUGH TICKETS Can be purchased at all principal Railroad Offices East and South, and in Chicago at the Southeast corner of Lake and Clark Streets, and at the Passenger Stations as above.

H. P. STANWOOD, Gen. Ticket Agt.
GEO. L. DUNLAP, Gen'l Supt.

Western Union Railroad.

CHICAGO & NORTHWESTERN DEPOT, CHICAGO. | MILWAUKEE & CHICAGO DEPOT, MILWAUKEE.

THE DIRECT ROUTE!

CHICAGO, RACINE & MILWAUKEE,

— TO —

Beloit, Savanna, Clinton, Pt. Byron, Davenport, Mineral Point, Madison, Freeport, Fulton, Lyons, Rock Island, Sabula, Galena, Dubuque, Des Moines, Council Bluffs,

OMAHA, SAN FRANCISCO

AND ALL PRINCIPAL POINTS IN

Southern and Central Wisconsin, Northern Illinois, and Central and Northern Iowa.

FRED. WILD, Gen. Ticket Agent.
D. A. OLIN, Gen Superintendent.

CRERAR, ADAMS & CO.,

MANUFACTURERS AND DEALERS IN

Railroad Supplies!

—AND—

CONTRACTORS' MATERIAL.

11 and 13 Wells Street,

CHICAGO, ILL.

Manufacturers of IMPROVED HEAD-LIGHTS for Locomotives, Hand and Signal Lanterns, Car and Station Lamps, Brass Dome Casings, Dome Mouldings, Cylinder Heads, and Car Trimmings, of Every Description.

Pan-Handle

— AND —

Penn'a Central Route East!

☞ SHORTEST AND QUICKEST ROUTE, VIA COLUMBUS, TO ☜

PITTSBURGH, BALTIMORE, PHILADELPHIA & NEW YORK

On and after Saturday, JULY 10th, 1870, Trains for the East will run as follows:

[DEPOT CORNER CANAL AND KINZIE STS., WEST SIDE.]

8:10 A. M. DAY EXPRESS.

[SUNDAYS EXCEPTED.] Via Richmond. Arriving at

COLUMBUS ...	2:35 A. M.	HARRISBURG..	10:35 P. M.	NEW YORK....	6:40 A. M.
PITTSBURGH..	12:00 M.	PHILADELPHIA	3:10 A. M.	BALTIMORE...	2:30 A. M.
				WASHINGTON..	5:30 A. M.
				BOSTON.....	5:05 P. M.

7:40 P. M. NIGHT EXPRESS.

[SATURDAYS EXCEPTED.] Arriving at:

COLUMBUS...	11:15 A. M.	HARRISBURG..	5:10 A. M.	NEW YORK...	12:10 P. M.
PITTSBURGH..	7:05 P. M.	PHILADELPHIA	9.35 A. M.	BALTIMORE...	9:00 A. M.
				WASHINGTON.	1:10 P. M.
				BOSTON.....	11:50 P. M.

Palace Day and Sleeping Cars

Run Through to COLUMBUS, and from Columbus to NEW YORK, WITHOUT CHANGE!

ONLY ONE CHANGE TO NEW YORK, PHILADELPHIA, OR BALTIMORE!

CINCINNATI & LOUISVILLE AIR LINE SOUTH.

35 Miles the Shortest Route to Cincinnati,
18 Miles the Shortest Route to Indianapolis and Louisville.

2 Hours the Quickest Route to Cincinnati!

THE SHORTEST AND BEST ROUTE TO

Columbus, Chillicothe, Hamilton, Wheeling, Parkersburg, Evansville, Dayton, Zanesville, Marietta, Lexington, Terre Haute, Nashville,

ALL POINTS IN CENTRAL & SOUTHERN OHIO, & INDIANA, KENTUCKY & VIRGINIA.

— QUICK, DIRECT AND ONLY ALL RAIL ROUTE TO —

New Orleans, Memphis, Mobile, Vicksburg, Charleston, Savannah,

AND ALL POINTS SOUTH.

Cincinnati, Indianapolis and Louisville Trains run as follows:

THROUGH WITHOUT CHANGE OF CARS!

8:10 A. M. (Sundays excepted) Arriving at		7:40 P. M. (Saturdays excepted.) Arriving at	
LOGANSPORT	1:15 P. M.	LOGANSPORT	1:30 A. M.
KOKOMO	2:33 P. M.	KOKOMO	2:45 A. M.
CINCINNATI	9:30 P. M.	CINCINNATI	10:30 A. M.
INDIANAPOLIS	5:00 P. M.	INDIANAPOLIS	5:40 A. M.
LOUISVILLE	11:30 P. M.	LOUISVILLE	3:50 P. M.

Lansing Accommodation: Leaves 5:10 P. M. Arrives 8:55 A. M.

PULLMAN'S PALACE SLEEPING CARS!

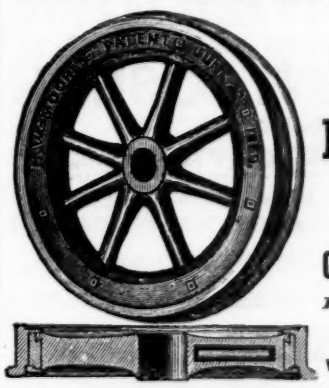
Accompany all Night Trains between Chicago and Cincinnati or Indianapolis.

☞ Ask for Tickets **via COLUMBUS** for the East, and **via "The AIR LINE"** for Cincinnati, Indianapolis, Louisville and points South. Tickets for sale and Sleeping Car Berths secured at **95 RANDOLPH STREET, CHICAGO,** and at Principal Ticket Offices in the West and Northwest.

WM. L. O'BRIEN, Gen. Pass. and Ticket Agent, Columbus.
I. S. HODSDON, Northwestern Pass. Agt., Chicago
D. W. CALDWELL Gen Supt. Columbus.

MOORE
Steel Elastic Car Wheel Co.

OF NEW JERSEY.



Proprietors of

MOORE'S PATENT

FOR THE MANUFACTURE OF

ELASTIC CAR WHEELS,

FOR PASSENGER AND SLEEPING COACHES.

Noiseless, Safe, Durable and Economical.

Also, Manufacturers of

CAR WHEELS OF EVERY DESCRIPTION.

H. W. MOORE, President.
JAS. K. FROTHINGHAM, Secretary.
F. W. BLOODGOOD, Treasurer.

Works, cor. Green and Wayne Sts., JERSEY CITY, N. J
P. O. Address—Box 129, Jersey City, N. J.

American Compound Telegraph Wire.

More than 3000 Miles now in Operation,

Demonstrating beyond question its superior working capacity, and great ability to withstand the elements. For RAILROAD LINES, connecting a single wire with a large number of Stations, and for long circuits, this wire is peculiarly adapted; the large conducting capacity secured by the copper, with other advantages, rendering such lines fully serviceable during the heaviest rains.

Having a core of steel, a small number of poles only are required, as compared with iron wire construction, thereby preventing much loss of the current from escape and very materially reducing cost of maintenance OFFICE AMERICAN COMPOUND TELEGRAPH WIRE CO.
234 West 29th Street, New York.

BLISS, TILLOTSON & CO., Western Agents,
247 South Water Street, Chicago.

THE FAVORITE THROUGH PASSENGER ROUTE!

Chicago, Burlington & Quincy
RAILROAD LINE.

3 THROUGH EXPRESS TRAINS DAILY!

FROM CHICAGO	Hours.	1st Class Fare.	FROM CHICAGO	Days.	1st Class Fare.
TO OMAHA, - - -	23	$20.00	TO DENVER, - -	2½	$65.00
" ST. JOSEPH, - -	21	19.50	" SACRAMENTO, -	4½	118.00
" KANSAS CITY, -	22	20.00	" SAN FRANCISCO,	5	118.00

TRAINS LEAVE CHICAGO from the Great Central Depot, foot of Lake Street, as follows:

BURLINGTON, KEOKUK, COUNCIL BLUFFS & OMAHA LINE

7:40 A. M. **MAIL AND EXPRESS.** (Except Sunday,) stopping at all stations; making close connections at Mendota with Illinois Central for Amboy, Dixon, Freeport, Galena, Dunleith, Dubuque, LaSalle, El Paso, Bloomington, &c.

10:45 A. M. **PACIFIC FAST LINE.** (Except Sunday,) stopping at Riverside, Hinsdale, Aurora, Leland, Mendota, Princeton, Buda, Kewanee, Galva, Galesburg, and all stations West and South of Galesburg.
☞ ELEGANT DAY COACHES and **PULLMAN PALACE DRAWING ROOM CARS** are attached to this train daily from Chicago

TO COUNCIL BLUFFS & OMAHA WITHOUT CHANGE!

5.00 P. M. **EVENING EXPRESS,** (Daily, except Saturday,) for Burlington, Ottumwa, DesMoines, Nebraska City, Council Bluffs, Omaha, and all points West. **Pullman Drawing Room Sleeping Car** attached to this Train daily from **Chicago to Ottumwa,** and Elegant Day Coaches, from **Chicago to Council Bluffs and Omaha, without change!**

11:30 P. M. **NIGHT EXPRESS,** (Daily, except Saturday,) stopping at all principal Stations between Chicago and Burlington. Elegant Day Coaches, and a **Pullman Palace Sleeping Car** are attached to this Train from **Chicago to Burlington, without change!** This is the Route between

CHICAGO, COUNCIL BLUFFS & OMAHA,

—RUNNING THE CELEBRATED—

Pullman Palace Dining Cars!

49 MILES THE SHORTEST ROUTE BETWEEN

Chicago & Keokuk,

And the Only Route Without Ferrying the Mississippi River!

QUINCY, ST. JOSEPH, LEAVENW'TH & KANSAS CITY LINE.

10:45 A. M. **PACIFIC EXPRESS,** (Daily, except Sunday,) with ELEGANT DAY COACHES and PULLMAN'S PALACE SLEEPING CARS attached, running through from Chicago to KANSAS CITY, **Without Change!**

5:00 P. M. **EVENING EXPRESS,** (Daily,) with **Pullman Palace Drawing Room Sleeping Car** attached running through from Chicago to QUINCY, KANSAS CITY, LAWRENCE, TOPEKA and DENVER, WITHOUT CHANGE.

11:30 P. M. **NIGHT EXPRESS,** (Daily, except Saturday,) with **Pullman Palace Sleeping Car** attached from Chicago to GALESBURG: PALACE DAY COACHES from Chicago to QUINCY, **Without Change!**

64 MILES THE SHORTEST AND ONLY ROUTE BETWEEN

Chicago and Kansas City!

WITHOUT CHANGE OF CARS OR FERRY.

115 MILES The Shortest Route bet. Chicago & St. Joseph.

THE SHORTEST, BEST AND QUICKEST ROUTE BETWEEN CHICAGO AND

Atchison, Weston, Leavenworth, Lawrence,

AND ALL POINTS ON THE KANSAS PACIFIC R'Y.

Local Trains Leave { RIVERSIDE & HINSDALE ACCOMMODATION.7:00 A. M. 1:30 & 6:15 P.M.
MENDOTA PASSENGER.....4:15 P. M.
AURORA PASSENGER.....5:30 P. M.

Ask for Tickets via Chicago, Burlington & Quincy Railroad, which can be obtained at all principal offices of connecting roads, and at Company's office in Great Central Depot, Chicago at as low rates as by any other route.

ROB'T HARRIS, Gen'l Superintendent, CHICAGO.
SAM'L POWELL, Gen'l Ticket Agent, CHICAGO.
E. A. PARKER, Gen. West. Pass. Agt., CHICAGO.

THE GREAT THROUGH PASSENGER ROUTE TO KANSAS

IS VIA THE OLD RELIABLE

HANNIBAL & ST. JOSEPH
SHORT LINE.

Crossing the Mississippi at Quincy and the Missouri at Kansas City on New Iron Bridges; running Three Daily Express Trains, Through Cars and Pullman Sleeping Palaces from Chicago & Quincy to St. Joseph & Kansas City.

The Advantages gained by this Line over any other Route from Chicago, are:

115 MILES THE SHORTEST!

To St. Joseph, Atchison, Hiawatha, Waterville, Weston, Leavenworth,

64 MILES THE SHORTEST!

To Kansas City, Fort Scott, Lawrence, Ottawa,

Garnett, Iola, Humboldt, Topeka, Burlingame, Emporia, Manhattan, Fort Riley, Junction City, Salina, Ellsworth, Hays, Sheridan, Olathe, Paola, Cherokee Neutral Lands, Baxter Springs, Santa Fe, New Mexico, and all Points on the KANSAS PACIFIC, and MISSOURI RIVER, FT. SCOTT & GULF R. R's, with which we connect at Kansas City Union Depot.

THIS BEING THE SHORTEST LINE AND QUICKEST, is consequently the cheapest; and no one that is posted thinks of taking any other Route from Chicago to reach principal points in

Missouri, Kansas, Indian Territory, or New Mexico.

DAILY OVERLAND STAGES from west end Kansas Pacific Railway, for Pueblo, Santa Fe, Denver, and points in Colorado and New Mexico.

This is also a most desirable Route, via St. Joseph, to Brownsville, Nebraska City, Council Bluffs, and Omaha, connecting with the Union Pacific Railroad for Cheyenne, Denver, Salt Lake, Sacramento, San Francisco, and the Pacific coast.

Through Tickets for Sale at all Ticket Offices. Baggage Checked Through, and Omnibus Transfers and Ferriage avoided.

P. B. GROAT, Gen. Ticket Agent. HANNIBAL, MO
GEO. H. NETTLETON, Gen. Supt. HANNIBAL, MO.

Old, Reliable, Air-Line Route!

CHICAGO, ALTON & ST. LOUIS R. R.

SHORTEST, QUICKEST AND ONLY DIRECT ROAD TO

Bloomington, Springfield, Jacksonville, Alton

— AND —

ST. LOUIS!

WITHOUT CHANGE OF CARS.

THE ONLY ROAD MAKING IMMEDIATE CONNECTIONS AT ST. LOUIS WITH MORNING AND EVENING TRAINS

—FOR—

ATCHISON, LEAVENWORTH, KANSAS CITY,

Lawrence, Topeka, Memphis, New Orleans,

And All Points South and Southwest.

☞ TRAINS leave CHICAGO from the West-side Union Depot, near Madison Street Bridge. ☜

EXPRESS MAIL, [Except Sundays]	8:10 A. M.
LIGHTNING EXPRESS, [Except Saturdays and Sundays]	9:50 P. M.
NIGHT EXPRESS, [Daily]	6:00 P. M.
JOLIET ACCOMMODATION, [Except Sundays]	4:40 P. M.
JACKSONVILLE EXPRESS, [Daily]	6:00 P. M.

Trains arrive at Chicago at 8.00 P. M., 8.30 A. M. and 6:00 A. M. Joliet Accom., 9.40 A. M.

This is the ONLY LINE Between CHICAGO & ST. LOUIS RUNNING

Pullman's Palace Sleeping and Celebrated Dining Cars!

BAGGAGE CHECKED THROUGH.

Through Tickets can be had at the Company's office, No. 55 Dearborn street, Chicago, or at the Depot, corner of West Madison and Canal streets, and at all principal Ticket Offices in the United States and Canada. Rates of Fare and Freights as low as by any other Route.

A. NEWMAN, Gen. Pass. Agent. **J. C. McMULLIN, Gen. Supt.**

North Missouri R. R.

PASSENGERS FOR

KANSAS AND THE WEST,

ARE REMINDED THAT

THE NORTH MISSOURI R. R.

—IS—

11 MILES SHORTER than any other Route!

BETWEEN

St. Louis and Kansas City.

15 Miles Shorter between ST. LOUIS and LEAVENWORTH

— AND —

49 MILES SHORTER TO ST. JOSEPH!

THAN ANY OTHER LINE OUT OF ST. LOUIS.

☞ **Three Through Express Trains Daily!** ☜

Pullman's Celebrated Palace Sleeping Cars on all Night Trains!

☞ **FOR TICKETS,** apply at all Railroad Ticket Offices, and see that you get your Tickets via St. Louis and North Missouri Railroad.

C. N. PRATT, Gen. Eastern Agt., 111 Dearborn-st. CHICAGO.
S. H. KNIGHT, Gen. Superintendent, ST. LOUIS.

JAS. CHARLTON, Gen. Pass. and Ticket Agt., St. Louis.

Pacific Railroad of Missouri.

THE MOST DIRECT AND RELIABLE ROUTE FROM ST. LOUIS THROUGH TO

KANSAS CITY, LEAVENWORTH & ATCHISON,

☞ WITHOUT CHANGE OF CARS! ☜

Close Connections at KANSAS CITY with Missouri Valley, Missouri River, Ft. Scott & Gulf, and Kansas Pacific R'ys, for Weston, St. Joseph, Junction City, Fort Scott, Lawrence, Topeka, Sheridan, Denver, Fort Union, Santa Fe, and

ALL POINTS WEST!

☞ At SEDALIA, WARRENSBURG and PLEASANT HILL, with Stage Lines for Warsaw, Quincy, Bolivar, Springfield, Clinton, Osceola, Lamar, Carthage, Granby, Neosho, Baxter Springs, Fort Gibson, Fort Smith, Van Buren, Fayetteville, Bentonville.

PALACE SLEEPING CARS on all NIGHT TRAINS.

Baggage Checked Through Free!

THROUGH TICKETS for sale at all the Principal Railroad Offices in the United States and Canadas. **Be Sure and Get your Tickets over the PACIFIC R. R. OF MISSOURI.**

W. B. HALE, Gen. Pass. and Ticket Agt.
THOS. McKISSOCK, General Superintendent.

THREE HOURS IN ADVANCE OF ALL OTHER ROUTES!

Sixty-One Miles the Shortest Line! Only 27 Hours!

— FROM —

CHICAGO TO NEW YORK.

Pittsburgh, Ft. Wayne & Chicago and Pennsylvania Central

IS THE ONLY ROUTE RUNNING ITS ENTIRE TRAIN THROUGH TO PHILADELPHIA AND NEW YORK, AND THE ONLY ROUTE RUNNING

THREE DAILY LINES OF PULLMAN'S DAY AND SLEEPING PALACES,

— FROM CHICAGO TO —

PITTSBURGH, HARRISBURG, PHILADELPHIA & NEW YORK,

☞ WITHOUT CHANGE! ☜

WITH BUT ONE CHANGE TO

BALTIMORE, PROVIDENCE, NEW HAVEN,

HARTFORD, SPRINGFIELD, WORCESTER AND BOSTON!

And the Most Direct Route to Washington City.

☞ Trains Leave WEST SIDE UNION DEPOT, corner West Madison and Canal Streets, as follows:

LEAVE:	Mail	Fast Express.	Pacific Exp.	Night Exp.	VALPARAISO ACCOMMODATION. Leaves CHICAGO daily, (except Sunday,) at 4:50 P. M.
CHICAGO	5.50 A. M.	11.00 A. M.	5.15 P. M.	9.00 P. M.	
PLYMOUTH	9.50 "	1 50 P. M.	s. 9 10 "	2.13 A. M.	
FORT WAYNE	12 40 P. M.	3.20 "	11.30 "	b. 5.30 "	
LIMA	3.15 "	.... "	1.25 A. M.	8.10 "	
FOREST	4.37 "	.... "	2 48 "	9 40 "	
CRESTLINE	6.00 A. M.	s. 6.55 "	4.30 "	D 13.05 P. M.	
MANSFIELD	6 42 "	7.16 "	5.00 "	12.34 "	
ORRVILLE	9 05 "	8 42 "	6 45 "	2.27 "	
ALLIANCE	10 45 "	9.55 "	b. 8.40 "	3.55 "	
ROCHESTER	D. 2 05 P. M.	12.17 A. M.	10.52 "	6.02 "	South'n Exp.
PITTSBURGH	3 15 "	12.50 "	12.45 P. M.	s. 7.50 "	5.30 A. M
BLAIRSVILLE BRANCH	6.05 "	.... "	2.49 "	9.54 "	7.23 "
JOHNSTOWN	6.56 "	.... "	3.37 "	10.42 "	8.08 "
CRESSON	7.58 "	.... "	4.38 "	11.43 "	9.04 "
ALTOONA	s. 9.05 "	s. 4.40 "	s. 5.45 "	12.35 A. M.	b.10.05 "
HUNTINGDON	10.21 "	.... "	7.04 "	1.45 "	11.14 "
LEWISTOWN	11.44 "	.... "	8.23 "	2.59 "	12.25 P. M.
HARRISBURG	2.10 A. M.	8.23 "	10.45 "	5.30 "	D. 2.50 "
LANCASTER	3.40 "	.... P. M.	12.15 A. M.	7.00 "	4.10 "
DOWNINGTON	5.00 "	.... "	1.40 "	b. 8.16 "	5.35 "
ARRIVE:					
PHILADELPHIA	6.30 "	12.20 "	3.10 "	9.40 "	7.00 "
NEW YORK, VIA PHILADELPHIA	10.41 "	3.00 "	6.43 "	1.00 P. M.	10.26 "
NEW YORK, VIA ALLENTOWN	.. ..	3.50 "	.....	12.05 P. M.	.....
BALTIMORE	....	12.10 "	4.20 "	9.00 A. M.	7.00 "
WASHINGTON	....	3.40 "	5.50 "	1.00 P. M.	10 00 "
BOSTON	9.00 P. M.	5.50 A. M.	5.05 P. M.	11.50 "	.....

THE FAST EXPRESS Leaves Chicago daily, except Sunday; the entire Train,—Baggage, Day and Pullman's Palace Cars—RUNNING THROUGH from Chicago to New York, via Mantua Junction; leaves Pittsburgh daily, except Monday. This train **reaches NEW YORK in time to make close connection for BOSTON!** No other Route through New York makes it! Arrives in BALTIMORE **Five Hours,** and WASHINGTON **Four Hours in Advance of Rival Routes!**

THE PACIFIC EXPRESS Leaves Chicago and Pittsburgh daily, for Philadelphia and New York, with PULLMAN PALACE CARS from Chicago; leaves Harrisburg for Baltimore daily, except Sunday; has SLEEPING CARS from Chicago to Pittsburgh, and from Altoona to Philadelphia. This train arrives in BALTIMORE **Nine Hours,** and WASHINGTON **Seven Hours, in Advance of all other Lines!**

THE NIGHT EXPRESS Leaves Chicago daily, except Saturday and Sunday; leaves Pittsburgh daily, except Sunday; leaves Harrisburg for Baltimore daily; has PULLMAN'S PALACE CARS from Chicago to Philadelphia and New York; has SLEEPING CARS from Chicago to Crestline, and from Pittsburgh to New York, Philadelphia and Baltimore This train reaches BALTIMORE **Three Hours in Advance of competing Routes!**

THE MAIL Leaves Chicago daily, except Sunday, stopping at all Stations, and reaching Crestline the same evening [where passengers can transfer to Day Express]; leaves Crestline [Express,] the next morning, and leaves Pittsburgh daily, except Sunday. SLEEPING CARS from Pittsburgh to Philadelphia.

THE SOUTHERN EXPRESS Leaves PITTSBURGH daily, except Monday, with SILVER PALACE CARS to Philadelphia and New York; leaves Harrisburg for Baltimore daily, except Sunday.

BOSTON AND NEW ENGLAND PASSENGERS will find this Route especially Desirable, as it Gives them an opportunity of Seeing the FINEST VIEWS AMONG THE ALLEGHANY MOUNTAINS,

Besides Visiting PITTSBURGH, PHILADELPHIA and NEW YORK, without extra cost!

All New England Passengers holding Through Tickets, will be Transferred, with their Baggage, to Rail and Boat Connections in NEW YORK, WITHOUT CHARGE.

Close Connections Made at Lima for all Points on the Dayton & Mich. and Cin., Hamilton & Dayton R'ys.

And at CRESTLINE, for CLEVELAND, ERIE, DUNKIRK, BUFFALO, NIAGARA FALLS, and all Points reached via Lake Shore R.R.

THROUGH TICKETS for sale at the Company's Offices, at 65 Clark St., and also at 52 Clark St.; cor. Randolph and Wells St.; at N. E. corner of Randolph and LaSalle Sts.; and at Depot, Chicago. Also at Principal Ticket Offices in the West.

All Express Trains are Equipped with WESTINGHOUSE AIR BRAKES,—the most perfect Protection against Accidents in the World.

F. R. MYERS, Gen. Pass. and Ticket Agt, P. & F. W. R'y, Chicago. W. C. CLELAND, Gen. Western Pass. Agt, P. Ft. W. & C. R'y, Chicago.
T. L. KIMBALL, Gen. Western Pass. Agent, Penn. Central R. R., Chicago.

J. H. LINVILLE, PRESIDENT. J. L. PIPER, GEN. MANAGER. A. G. SHIFFLER, SUP'T & TREAS.

The Keystone Bridge Company

OF PITTSBURGH, PENN.

Office and Works, 9th Ward, Pittsburgh, Pa. Philadelphia Office, 426 Walnut Street.

GENERAL WESTERN OFFICE:—13 Fullerton Block, 94 Dearborn St., CHICAGO, ILL.

☞ This Company possess unrivaled facilities for manufacturing and erecting every description of **Iron and Wooden Railway and Road Bridges, Roofs, Turn-Tables and Buildings, "Linville and Piper" Patent Iron Bridges, Self-Sustaining Pivot Bridges, Suspension Bridges, and Ornamental Park Bridges.** Contractors for Wooden or Iron Bridges of any pattern, as per plans and specifications. Circulars sent on application.

WALTER KATTE, ENGINEER. A. D. CHERRY, SECRETARY.

PITTSBURGH CAST STEEL SPRING WORKS.

A. French & Co.,

Manufacturers of Extra Tempered, Light Elliptic

CAST STEEL SPRINGS,

FOR RAILROAD CARS AND LOCOMOTIVES,

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— BETWEEN —

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4 EXPRESS TRAINS DAILY, [Sundays Excepted,] Leave Chicago from the New Depot, on Van Buren St., at the head of La Salle Street, as follow

7:30 A. M. MAIL TRAIN.
VIA OLD ROAD AND AIR LINE. SUNDAYS EXCEPTED.

Leaves 33d Street 7:45 A. M. Stops at all Stations. **Arrives**—Toledo, 6:20 P. M.

11:30 A. M. SPECIAL NEW YORK EXPRESS,
-A AIR LINE. SUNDAYS EXCEPTED.

Leaves—Twenty-Second Street, 11:45 A. M. **Arrives**—Elkhart, 2:55 P. M.; Cleveland 10:40 P. M.; Buffalo, 4:10 A. M.; New York, 5:30 P. M.; (Chicago Time) Boston, 11:45 P. M.

This Train has PALACE SLEEPING COACH Attached, Running

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Only Thirty Hours, Chicago to New York!

5:15 P. M. ATLANTIC EXPRESS (Daily),
VIA OLD ROAD.

Leave—Twenty-Second Street 5:30 P. M. **Arrives**—Laporte, 8:10 P. M. (Stops 20 minutes or Supper); arrives at Toledo, 2:50 A. M.; Cleveland, 7:25 A. M. (20 minutes for Breakfast); arrives at Buffalo, 1:50 P. M.; Rochester, 5:10 P. M. (20 minutes for Supper); connects with **Sleeping Coach running Through from Rochester to Boston Without Change,** making but **One Change between Chicago and Boston.**

NEW AND ELEGANT SLEEPING COACH Attached to this Train, Running THROUGH from CHICAGO TO NEW YORK WITHOUT CHANGE! Arrives at NEW YORK, 6:40 A. M.

9:00 P. M. NIGHT EXPRESS
VIA AIR LINE. (DAILY EXCEPT SAT. & SUN.)

Leaves—Twenty-Second Street, 9:15 P. M. **Arrives**—Toledo, 6:00 A. M. (20 minutes for Breakfast); arrives at Cleveland, 10:35 A. M.; Buffalo, 5:30 P. M.; New York, 11:00 A. M.; Boston, 3:50 P. M.

KALAMAZOO DIVISION.

Leave Chicago 11:30 A. M. Arrive at Kalamazoo 5:30 P. M.; Grand Rapids, 8:15 P. M.

Leave Chicago 9:00 P. M. Arrive at Kalamazoo 7:10 A. M.; Grand Rapids, 10:20 A. M.

Elkhart Accommodation leaves Chicago, 3:30 P. M. Arrives at Elkhart, 8:20 P. M.

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8:30 P. M. CAIRO EXPRESS, Except Saturdays.
Arriving at **Cairo** 3:15 P. M., **Memphis** 2:30 A. M., **Vicksburg** 5:00 P. M., **New Orleans** 1:30 A. M.

4:55 P. M. CHAMPAIGN PASSENGER,
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9:30 A. M. KEOKUK PASSENGER, Sun. Excepted.
Arriving at **Chenoa** 3:15 P. M., **El Paso** 4:05 P. M., **Peoria** 5:40 P. M., **Canton** 7:14 P. M., **Bushnell** 8:59 P. M., **Keokuk** 11:26 P. M., **Warsaw** 12:05 A. M.

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HYDE PARK TRAIN...	*8:00 A. M.	*9.15 A. M.	HYDE PARK TRAIN,...	*6:10 P. M.	*7:35 P. M
HYDE PARK TRAIN,..	*12:10 P. M.	*1:50 P. M.			

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(DEPOT, FOOT OF LAKE STREET,) as Follows:

5:00 A. M. MAIL TRAIN. Stops at all Stations.
(SUNDAYS EXCEPTED.) Arrives DETROIT at 5:40 P. M.

11:30 A. M. SPECIAL NEW YORK & BOSTON EXP.
(SUNDAYS EXCEPTED.) Arrives at Michigan City 1:18 P. M.; New Buffalo 1:32, Niles 2:15, [Dinner], Kalamazoo 3:32 P. M.; Battle Creek 4:28, Marshall 4:48, Jackson 5:45, Detroit 7:55, London 12:05, A. M Hamilton 3:35 A. M; Toronto 9 20, Suspension Bridge 3:55, Rochester 7:00 A. M; Albany, 2:00 P. M.; NEW YORK, 6:25, BOSTON, 11:50 P. M. ☞ This train connects at ROCHESTER (7:00 A. M.) with

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☞ RUNNING THROUGH TO NEW YORK, WITHOUT CHANGE! ☜

5:15 P. M. ATLANTIC EXPRESS.
(DAILY.) Arrives at Michigan City, 7:18 P. M.; Niles 8:30 P. M. [Supper]; Kalamazoo, 10:25 P. M.; Jackson, 1:00 A. M.; Detroit 3:40, London, 8:35, [Breakfast]; Hamilton 11:40, Suspension Bridge 1:30 P. M.; Rochester 5:00 P. M.; Albany, 1:30 A. M; NEW YORK, 6:40 A. M.; BOSTON, 11:00 A. M.
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9:00 P. M. NIGHT EXPRESS.
(SAT. & SUN. EXCEPTED). Arrives at Michigan City, 11:03 P. M.; Niles, 12:25 A. M.; Kalamazoo, 2:00; Marshall, 3:12; Jackson, 4:25; Grand Trunk Junction, 7:00; Detroit, 7:30; London, 1:45 P. M.; Hamilton, 4:35; Toronto, 9:35; Niagara Falls, 6:15; Buffalo, 7:15 P. M.; Rochester, 9:10; Syracuse, 12:25 A. M.; Rome, 1:55; Utica, 3:25; Albany, 6:30 A. M.; NEW YORK, 10:00 A. M.; BOSTON, 3:40 P. M.

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TWO EXPRESS TRAINS Leave Chicago Depot, Foot of Lake as Follows:

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(EXCEPT SUNDAY.) Arriving at LaFayette, 2:25 P. M.; Indianapolis, 6:00 P. M; Louisville, 11:30 P. M.

4:30 P. M. AFTERNOON EXPRESS.
(EXCEPT SATURDAY) Arriving at Michigan City 6:30 P. M. [Supper]; LaFayette, 11:30 P. M. Indianapolis, 2:15 A. M.; Louisville, 7:00 A. M.; Nashville, 4.00 P. M.

A GOOD SLEEPING CAR is Attached to this Train Every Night,
And goes from Chicago to Louisville WITHOUT CHANGE!

☞ **SPECIAL NOTICE.**—This Train stops at Michigan City for Supper, and waits at that point for Michigan Central Atlantic Express East, leaving Chicago at 4:45 p. m. Passengers going South, and wishing as much time in Chicago as possible, can take the 4:45 p. m. Michigan Central Atlantic Express, and connect without fail at Michigan City, with above Through Louisville Express.

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